Jamaica
Office of Disaster Preparedness
and Emergency Management
(ODPEM)

PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR
IMPROVEMENT OF EMERGENCY
COMMUNICATION SYSTEM
IN
JAMAICA

FEBRUARY 2017

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

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Summary

1. Overview of Jamaica

Jamaica, one of the four islands of the Greater Antilles located in the northwest of the Caribbean Sea, has a population of approximately 2.7 million people (2014, Planning Institute of Jamaica). It has a national land area of 11,424 square kilometres, and the central part is dominated by undulating mountains and valleys. The highest peak is Blue Mountain with an altitude of 2,258 meters in the east. The coastline stretches for 1,022 kilometres in total and comprises diverse features including natural bays, secluded inlets, beaches, steep cliffs and so on. Jamaica has a tropical climate, and the capital city of Kingston has an annual average temperature of 27.6°C and annual average rainfall of 740 millimetres, but this rises to more than 5,000 millimetres on average in the mountains to the east. The rainy season in Jamaica lasts from May to October, and the hurricane season extends from June to November. During the hurricane season, since torrential rain often falls in short spells, there is a higher risk of climate-related disasters such as river flooding and so on. In recent years, the particularly destructive hurricanes of Ivan (2004), Dean (2007) and Nicole (2010) each caused economic damage equivalent to between 1~2% of the national GDP, indicating how costly hurricane damage can be.

The GDP of Jamaica is 734.9 billion JMD, the GDP growth rate is 0.366%, and per capita GDP is 4,898USD (2014, IMF). Jamaica's main industries are tourism, bauxite mining, and food processing (sugar, etc.). In terms of GDP share, primary industry accounts for 7.0%, secondary industry for 21.4%, and tertiary industry for 71.6% (2015, CIA), so service industries account for more than 70% of total GDP. Concerning exports and imports, intermediate goods account for the largest share of exports, while consumer goods are the main imports.

2. Background and Outline of the Project

Being situated in the Atlantic Ocean hurricane belt, Jamaica experiences frequent flood and sediment damage due to hurricanes and tropical storms as well as high intensity rainfall. In recent years, tropical storm Nicole (September 2010: cost of damage 240 million USD) and Hurricane Sandy (October 2012: cost of damage 107 million USD) resulted in loss of lives and damage to infrastructure. The Government of Jamaica has made "Hazard Risk Reduction and Adaptation to Climate Change" one of its development goals based on the Vision 2030 national development plan, and within this it has made "Improve emergency response capability" an important policy goal. The Office of Disaster Preparedness and Emergency Management (ODPEM), which is the disaster management supervisory and coordination agency, cooperates with disaster observation agencies, emergency response centres, etc. in operating the disaster response liaison setup, issuing warnings to disaster prevention-related agencies and so forth, however, its current disaster prevention radio network is not utilized due to lack of communications capacity and coverage, and it depends on unreliable methods such as emails, mobile phones, etc. to conduct communications. As a result, when disasters have occurred in the past, there have been problems

with delays in the communication of warnings, grasping of conditions and implementation of countermeasures.

Under these circumstances, Jamaica in December 2014 made a request to the Government of Japan for assistance in the construction of a radio communications system with a view to enhancing the speed and stability of information transmission when disasters occur.

Through establishing a nationwide digital radio communication system for disaster prevention and thereby strengthening the fragile radio communications system for disaster prevention, the Project aims to establish the base for realizing fast and stable information conveyance between disaster prevention-related agencies and toward the general public when disasters occur. In doing so, the Project aims to contribute towards making environmental improvements with a view to mitigating human damage when disasters occur in Jamaica. The Project is thus consistent with the development policies of Jamaica and the Government of Japan's aid policy, hence for Japan there is a high degree of necessity and validity in implementing the Project.

3. Outline of the Study Findings and Contents of the Project

JICA dispatched the outline design study team to Jamaica to conduct two field surveys: the first time from July 9 to July 28, 2015, and the second time from February 18 to April 23, 2016, in order to confirm the requested component of the Project and conduct field survey of the proposed sites for the equipment installation. On returning home, the team analyzed its findings, implemented the outline design and conducted the Project cost estimation. Based on the results, the team returned to Jamaica to conduct explanations of the outline design and the Project cost estimation to the Jamaican side between August 30 and September 8, 2016. Through constructing a nationwide digital radio network, the Project aims to establish the base for realizing fast and stable information conveyance between related agencies and toward the general public when disasters occur. Table 1 shows the equipment to be procured in the Project.

Table-1 Project Component

No.	Item	Q'ty
1	**Disaster-Emergency Communication System (DECOM)**	
1.1	Radio Repeater Station	24 locations
1.2	Two-Way Radio Terminal	
(1)	Base Radio	107 sets
(2)	Base Radio (Marine Type, DC24V)	2 sets
(3)	Mobile Radio	302 sets
(4)	Handheld Radio	845 sets
1.3	Integrated Command and Control Station	
(1)	National Command Station	1 location
(2)	Parish Control Station	14 locations
(3)	Portable Radio Station for Community	6 sets
(4)	Operation Station for Cay	2 sets
1.4	Communication Support Equipment	1 lot
2	**Early Warning System (EWANS)**	15 locations
3	**Maintenance Equipment and Tools**	1 lot
4	**Spare Parts**	1 lot

*New Concrete Hut is included in the Installation Work of Radio Repeater Station
Source: JICA Project Team

The responsible agency on the Jamaican side of the Project is the Ministry of Local Government and Community Development (MLGCD) and the implementing agency is ODPEM. Out of the two Project components, the Disaster-Emergency Communication System (DECOM) intends to build a route of information conveyance based on a digital radio network between disaster prevention agencies, while the Early Warning System (EWANS) intends to convey the warnings and evacuation orders issued by ODPEM to residents.

The current disaster prevention radio network in Jamaica utilizes the existing analogue VHF radio system, however, this does not possess sufficient communications capacity or wave coverage for disaster prevention purposes and is in need of urgent improvement. As a result of Project implementation, a digital radio system will be introduced for DECOM, leading to greatly enhanced functions through expanded coverage and additional channels, and it is anticipated that the system can also be used for communication purposes at ordinary times as well as during disasters.

4. Project Schedule and Cost estimation

The Project implementation schedule including the detail design, tender, and installation works will be 23 months based on the Guidelines of Japan's Grant Aid. The total project cost on the Jamaican side will be approximately 9.4 million yen comprising mainly the cost of repairing existing repeater station huts, the cost of employing additional ODPEM maintenance personnel and the commissions for banking services.

5. Evaluation of the Project

(1) Quantitative Effects

The present disaster radio network in Jamaica comprises fixed radio devices and mobile radio devices of differing types, frequencies and specifications that have been procured separately by different organizations, meaning that there is no compatibility for mutual communications and making it difficult to maintain the system. In the Project, through supplying radio equipment to the radio repeater stations and public agencies that serve as disaster prevention hubs, the effects described below are anticipated. Reference values are based on the existing radio network as of 2016, while the target values envisage the radio network three years after the Project completion.

1) Increase in communication capacity

Table-2 Comparison the number of Radio Repeater Stations between 2016 and After Implementation of the Project

Indicator	Reference value (2016)	Target value (2021)
Number of Voice line (exclude a control channel)	1 channel for all over the country	3 or 6 channels per Radio Repeater Station

2) Expansion of receiving coverage

Jamaica is an island nation with area equivalent to Akita Prefecture in Japan. The centre of the country consists of mountains and valleys and has traditionally had a prosperous coffee growing industry that exploits these topographical features. Many of the people who are engaged in such farming live in mountain communities that are vulnerable to disasters. Meanwhile, in coastal areas, many residents are engaged in small-scale fisheries and tourism, and since flatland suitable for residence can only be found in such coastal areas, the people live in an environment that is prone to the damaging effects of hurricane/storm surges and tsunami. It has been needed for a radio network for disaster prevention in Jamaica so far, however, because disaster prevention centres such as Parish Councils, police stations, fire stations and so on are mostly located in mountainous areas or narrow coastal strips close to hilly ground, where it is difficult for radio waves to reach, radio networks only have limited coverage. In the Project, through constructing additional radio repeater stations with a view to extending coverage nationwide, more public agencies and communities will come to utilize radio communications, and the following quantifiable effects are anticipated.

Table-3 Comparison the coverage between 2016 and After Implementation of the Project

Indicator	Reference value (2016)	Target value (2021)
Coverage for Community in Disaster Vulnerable Area	20-25%	90-95%

3) Speeding-up of information transmission (in case of radio communications)

In the existing analogue radio network, only one channel can be used; moreover, equipment deterioration has led to line instability. In order to realize speedier communications, it is necessary to compensate with mobile phones or communicate through police and fire department radio lines, thereby incurring additional time and effort. In the Project, however, through installing DECOM, it will become possible for the ODPEM National Emergency Operations Centre (NEOC) to instantaneously transmit the same information to Parish Emergency Operations Centres (PEOC), thereby enabling emergency communications and status reports between centres during disasters to be promptly communicated.

Table-4 Comparison the performance of information transmission between 2016 and After Implementation of the Project

Indicator	Reference value (2016)	Target value (2021)
Number of organizations of Disaster-Emergency Communication System	20	52
Transmission standard time (From ODPEM to Communities)	60 minutes	Less than 5 minutes

4) Establishment of a communications network for conveying disaster information to residents

Through introducing a siren system, it will be possible to conduct effective evacuation guidance. Since the sirens will be routinely used to call out to residents, this will promote dissemination and heightened awareness in disaster prevention and encourage evacuation training.

Table-5 Comparison effects of Siren System between 2016 and After Implementation of the Project

Indicator	Reference value (2016)	Target value (2021)
Beneficiaries by Siren System (researched by JICA Project Team)	Approximately 2,600 residents	Approximately 16,000 residents

(2) Qualitative Effects (Project overall)

1) Securing of a dedicated/stable disaster prevention network

In Jamaica, since private sector mobile phone networks are widely disseminated, people depend on mobile phones for conducting routine communications. At times of disaster, there is concern that because people and various agencies will use mobile phones at the same time, the urgent orders, communications and so on from ODPEM will not reach the Parish Councils, police stations, fire stations and hospitals. Accordingly, in the Project, it is intended to establish the nationwide disaster radio network (ODPEM ⇔ disaster prevention centres such as Parishes, police, etc.), and the local disaster radio network (Parishes ⇔ communities and shelters), thereby securing dedicated lines for those network and realizing speedy and stable information communications at times of disaster.

2) Disaster prevention effect

Through establishing a digital radio system, the Project will establish a communications setup serving all disaster prevention agencies in Jamaica centred on ODPEM and facilitate routing information exchange and linkage. Moreover, installation of a siren system will make it possible to convey information to residents and promptly convey evacuation orders to residents living in vulnerable coastal and mountainous areas. Furthermore, at ordinary times, it will be easier to make appeals concerning disasters to residents, conduct evacuation training and heighten awareness, thereby establishing rapid evacuation setups in readiness for disasters and mitigating human losses among the Jamaican people in the event of disaster.

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List of Abbreviations

AM	Amplitude Modulation
ATU	Auto-antenna Tuning Unit
BGAN	Broadband Global Area Network
CBDRM	Community Based Disaster Risk Management groups
CCDRM	The Canada Caribbean Disaster Risk Management Fund
CDEMA	Caribbean Disaster Emergency Management Agency
CIA	Central Intelligence Agency
CWJ	Cable & Wireless Jamaica Limited
DAC	Development Assistance Committee
DC	Direct Current
DECOM	Disaster-Emergency Communication System
DFATD	Department of Foreign Affairs, Trade and Development
E.A.R.S.	Emergency Affiliated Radio Service
EM-DAT	Emergency Events Database
EOC	Emergency Operation Centre
EWANS	Early Warning System
FM	Frequency Modulation
GDP	Gross Domestic Product
GPS	Global Positioning System
HF	High Frequency
IBC	International Building Code
IDB	Inter-American Development Bank
IMAJ	Incorporated Masterbuilders Association of Jamaica
IMF	International Monetary Fund
ITS	Intelligent Transportation Systems
JCAA	Jamaica Civil Aviation Authority
JCF	Jamaica Constabulary Force
JFB	Jamaica Fire Brigade
JMD	Jamaican Dollars
JPS	Jamaica Public Services
JS	Jamaican Standard- Building and associated materials
M/D	Minutes of Discussion

METS	Meteorological Service
MLGCD	Ministry of Local Government and Community Development
NDC	National Disaster Committee
NEOC	National Emergency Operation Center
NWA	National Works Agency
NWC	National Water Commission
NZC	National Zonal Committee
ODPEM	Office of Disaster Preparedness and Emergency Management
ODPERC	Office Disaster Preparedness and Emergency Relief Coordination
PAJ	Port Authority of Jamaica
PDC	Parish Disaster Committee
PEOC	Parish Emergency Operation Center
PEOD	Preparedness and Emergency Operations Division
SSB	Single Sideband
TVJ	Television Jamaica
UHF	Ultrahigh Frequency
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
UWI	Earthquake Unit, University of West Indies
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio
WRA	Water Resource Authority

CHAPTER 1 BACKGROUND OF THE PROJECT

Chapter 1 Background of the Project

1-1 Background and Outline of the Grant Aid

Being situated in the Atlantic Ocean hurricane belt, Jamaica experiences frequent flood and sediment damage due to hurricanes and tropical storms as well as high intensity rainfall. In recent years, tropical storm Nicole (September 2010: cost of damage 240 million USD) and Hurricane Sandy (October 2012: cost of damage 107 million USD) resulted in loss of lives and damage to infrastructure. The Government of Jamaica has made "Hazard Risk Reduction and Adaptation to Climate Change" one of its development goals based on the Vision 2030 national development plan, and within this it has made "Improve emergency response capability" an important policy goal. The Office of Disaster Preparedness and Emergency Management (ODPEM), which is the disaster management supervisory and coordination agency, cooperates with disaster observation agencies, emergency response centres, etc. in operating the disaster response liaison setup, issuing warnings to disaster prevention-related agencies and so forth, however, its current disaster prevention radio network is not utilized due to lack of communications capacity and coverage, and it depends on unreliable methods such as emails, mobile phones, etc. to conduct communications. As a result, when disasters have occurred in the past, there have been problems with delays in the communication of warnings, grasping of conditions and implementation of countermeasures.

Under these circumstances, Jamaica in December 2014 made a request to the Government of Japan for assistance in the construction of a radio communications system with a view to enhancing the speed and stability of information transmission when hazards occur.

Through establishing a nationwide digital radio communication system for disaster prevention and thereby strengthening the fragile radio communications system for disaster prevention, the Project aims to establish the base for realizing fast and stable information conveyance between disaster prevention-related agencies and toward the general public when disasters occur. In doing so, the Project aims to contribute towards making environmental improvements with a view to mitigating human damage when disasters occur in Jamaica. The Project is thus consistent with the development policies of Jamaica and the Government of Japan's aid policy, hence for Japan there is a high degree of necessity and validity in implementing the Project.

Furthermore, against a background of increasingly extensive damage to human lives and infrastructure as a result of natural disasters, it is necessary to address threats to individual dignity, life and lifestyle and from the viewpoint of human security, humanitarian needs can be recognized, and there is also great significance in implementing the Project under the grant aid program from the perspective of addressing global issues.

Table 1-1 shows the Project components. Based on the request from the Jamaican side and the findings of the field surveys by the JICA Project Team, discussions were held with ODPEM and the Minutes of Discussion (M/D) were signed on April 12, 2016 upon sorting the related items of the two equipment components. (See Annex 4)

Table 1-1 Project Components

<table>
<tr><td colspan="2">■ Equipment, facilities, etc.</td></tr>
<tr><td rowspan="4">Equipment</td><td>1) DECOM: Disaster-Emergency Communication System
・ Radio Repeater Station (24 locations)
・ Two-Way Radio Terminals (1,256 sets)
・ Integrated Command and Control Station (15 locations)
・ Portable Radio Station for Community (6 sets)
・ Operation Station for Cay (2 sets)
・ Communications Support Equipment (1 lot)</td></tr>
<tr><td>2) EWANS: Early Warning System (15 locations)</td></tr>
<tr><td>3) Maintenance Equipment and Tools (1 lot)</td></tr>
<tr><td>4) Spare Parts (1 lot)</td></tr>
<tr><td>Facilities
(Included in the installation works for the above equipment)</td><td>Radio repeater station huts (7 locations)</td></tr>
<tr><td colspan="2">■ Consulting Services</td></tr>
<tr><td colspan="2">・ Detailed design, tender assistance, procurement supervision</td></tr>
<tr><td colspan="2">■ Procurement sources of main equipment</td></tr>
<tr><td colspan="2">・ Main equipment (assuming procurement in Japan)</td></tr>
<tr><td colspan="2">・ Construction equipment and materials (assuming local procurement)</td></tr>
</table>

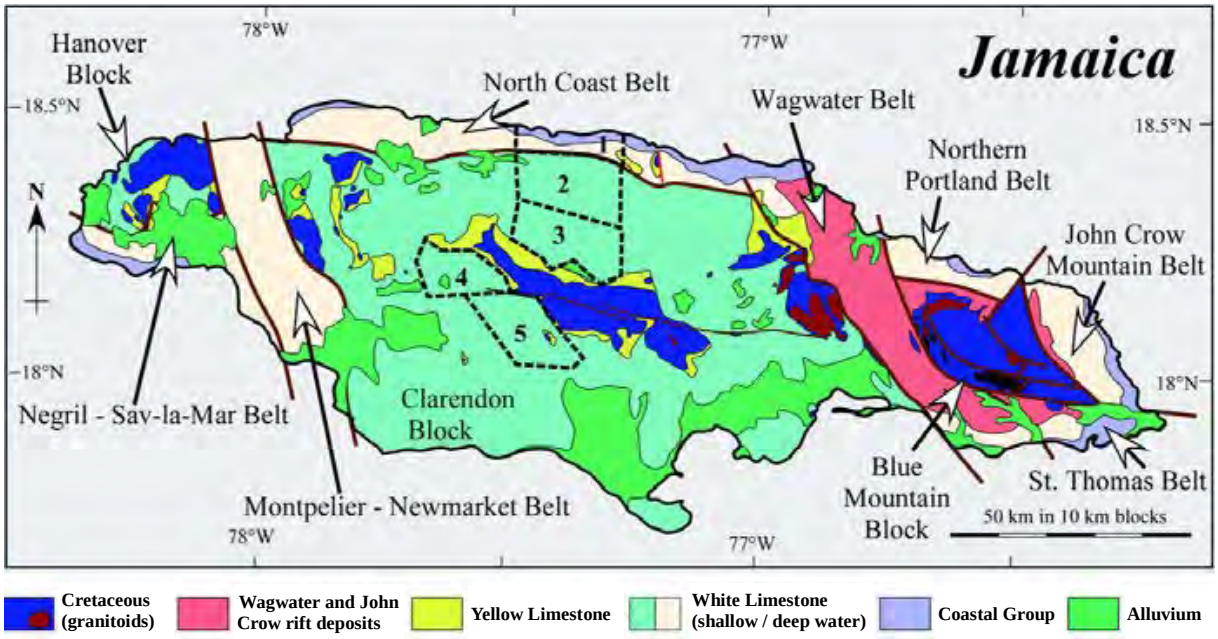
1-2 Natural Conditions

(1) Geography

Jamaica is one of the four islands of the Greater Antilles located in the northwest of the Caribbean Sea. It has a national land area of 11,424 square kilometres, and the central part is dominated by undulating mountains and valleys. Figure 1-2-1 shows the topographical distribution of Jamaica. The highest peak is Blue Mountain with an altitude of 2,258 meters in the east. The coastline stretches for 1,022 kilometres in total and comprises diverse features including natural bays, secluded inlets, beaches, steep cliffs and so on. Jamaica is broadly divided into three regions: “the mountain area in the east”, “the central mountain area” and “plateaus, tableland and the coastal plain”. The mountains form a range stretching in the southeast to northwest direction and are composed of igneous and metamorphic rocks from the Cretaceous period. Figure 1-2-2 shows the geological distribution of Jamaica. To the north of Blue Mountain are plateaus composed of folded limestone at elevation of 1,000 metres or more, and limestone karst covers two-thirds of the island.

Source: maps.com

Figure 1-2-1 Jamaica's Topography



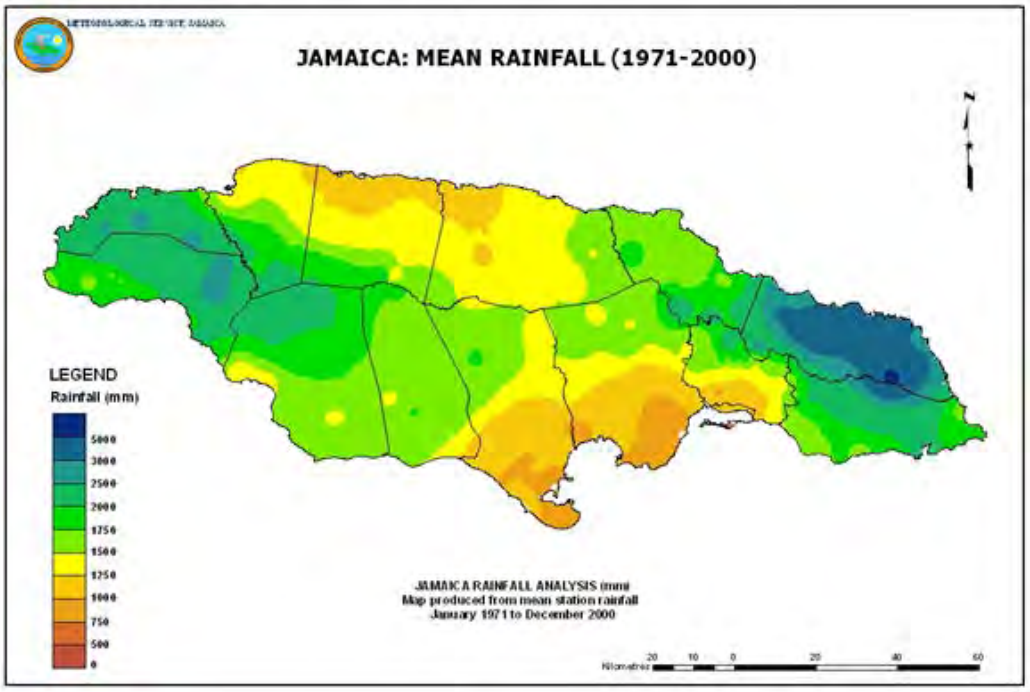
Source: GeoScience World

Figure 1-2-2 Geology of Jamaica

(2) Climate

Jamaica is situated in the tropical climate zone between north latitude 17 degrees and 18 degrees, and the capital city of Kingston has an annual average temperature of 27.6°C. Since this is a small island nation roughly the same size as Akita Prefecture, the climate is greatly influenced by the surrounding ocean. For example, whereas the average temperature in Kingston during the hottest month of July is 29.1°C, it only falls to an average of 26.1°C during the coolest month of February, demonstrating that there is hardly any seasonal disparity.

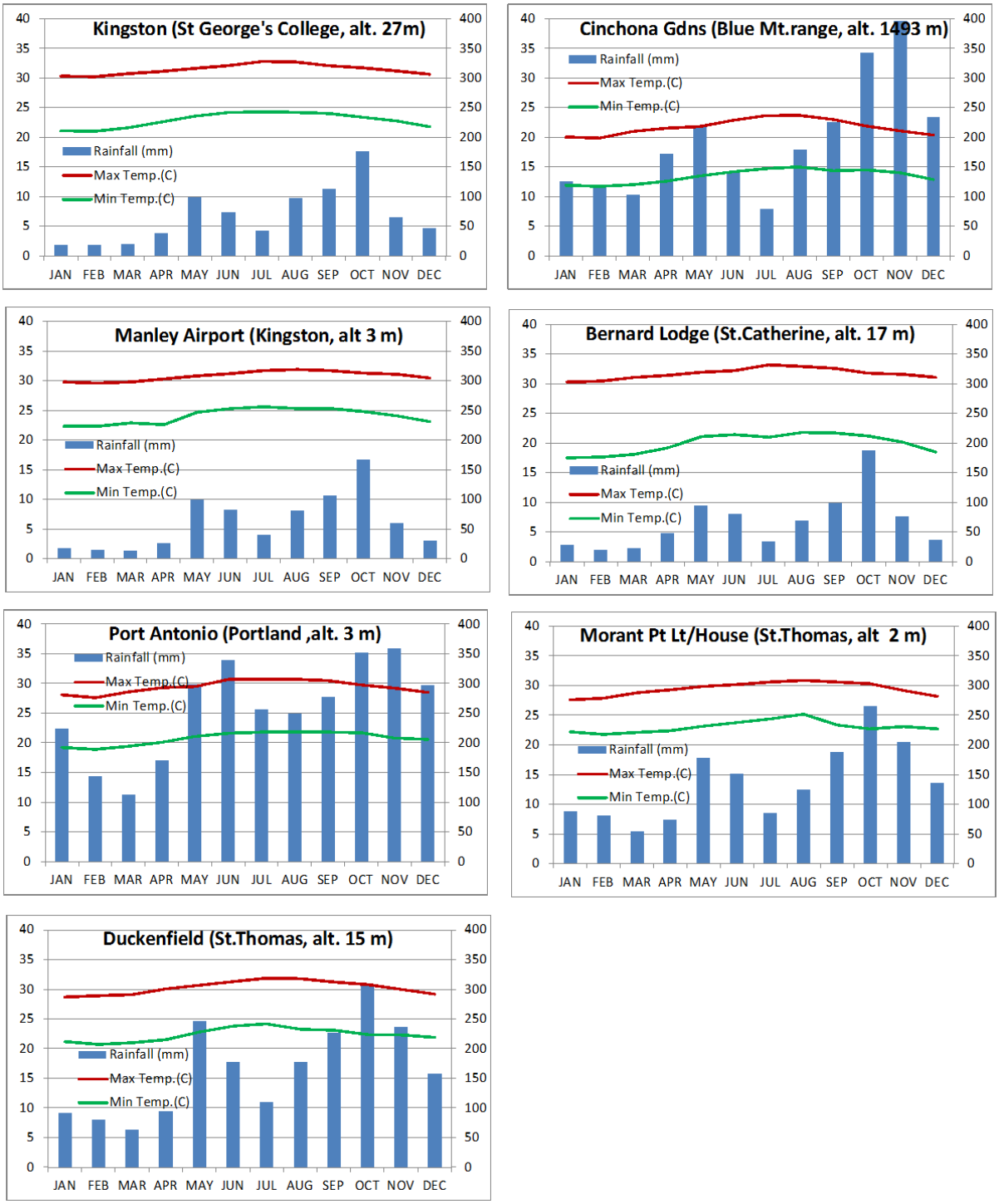
On the other hand, rainfall differs greatly according to terrain: whereas Kingston has annual average rainfall of 1,773 millimetres (1971~2000, METS), parts of the mountains in the east of the country record more than 5,000 millimetres per year on average. Figure 1-2-3 shows the annual average rainfall distribution (1971~2000). According to this, the mountains in the east and west experience the highest rainfall, whereas the plains in the north and south are relatively arid with 1,000 millimetres or less per year. The rainy season in Jamaica lasts from May to October, and the hurricane season extends from June to November. During the hurricane season, torrential rain often falls in short spells; hence there is a higher risk of climate-related disasters such as river flooding and so on.



Source: Meteorological Service, Jamaica

Figure 1-2-3 Annual Average Rainfall Distribution in Jamaica

Figure 1-2-4 shows graphs concerning weather conditions (temperature, rainfall) in the main areas of Jamaica.



Source: Meteorological Service, Jamaica (http://www.metservice.gov.jm/index.asp)

Figure 1-2-4 Weather Conditions (Temperature, Rainfall) in the Main Areas of Jamaica

(3) Survey of Natural Conditions

Concerning the candidate sites for radio repeater stations, out of the seven sites where it has been deemed necessary to construct new buildings, it is planned to install the storage container on the existing concrete foundations due to limited space on one site, and to newly construct

buildings on vacant space within the sites on the remaining six sites. Accordingly, concerning these six sites and 15 other sites where it is scheduled to install the siren system, ground and geological investigations were consigned to a local contractor in order to examine the usefulness of the sites and soil bearing capacity, etc. necessary to design the buildings. The following paragraphs describe the findings of the ground and geological investigations. (See Annex 10 for details).

1) Radio repeater station candidate sites

Table 1-2-1 shows the result of Soil Investigation on candidate sites for radio repeater station. The seven sites where it is necessary to construct new buildings are located on the top of mountain and these grounds were found to comprise mainly limestone. Each candidate site has bedrock as supporting layer on 0.3m to 2.5m below the existing ground level. And subsidence and land slide are thought not to occur because water table was not found from actual boring.

Table 1-2-1 Result of Soil Investigation on Candidate sites for Radio Repeater Station

Site No.	Candidate sites	Compressive Strength (Mpa)	Bearing Capacity (Mpa)	Supporting layer (Bedrock)
Rep006	Shotover	24.50	17.15	0.6~0.8m
Rep011	Cabbage Hill	58.12	29.06	0.9~1.0m
Rep017	Portland Cottage Lighthouse	40.49	24.29	0.3~1.5m
Rep020	Sliogoville	23.03	16.12	2.4~2.5m
Rep023	Shafton	41.99	25.19	0.3~0.8m
Rep024	Mount Airy	38.84	23.30	0.9~1.0m
Rep030	Winchester	45.40	22.70	0.9~1.0m

Source: JICA Project Team

Coring samples are found to have cracks and voids inside it and compressive strength values vary widely between gathered samples at the same sites. These soil layers are considered not always equable. However, from the above table, bearing capacity is found 16.12Mpa as minimum of each sample and is considered very firm and each ground is suitable for the supporting layer for foundation of a concrete hut.

2) Siren system candidate sites

Table 1-2-2 shows the result of Soil Investigation on candidate sites for siren system. Almost all of the 15 candidate sites are located on flatland in built-up areas except for Steep Slope and Dam Head Tower located in hill. As a result of implementing soil boring based on standard penetration tests on all the sites, it was found that the ground is composed of sand ground (including gravel, silt or clay on some of the sites). In five (5) candidate sites located in low altitude (Fishing Village, Castel Garden, Town Center, Clembhards Park and Trinity), water table is confirmed on 2.2m to 7.6m below the existing ground level. For that reason, siren tower foundation has wide basement and is set shallow level from existing ground level not to interfere with water table.

Table 1-2-2 Result of Soil Investigation on Candidate sites for Siren System

Area	Site No.	Sites	Allowable Bearing Capacity (kPa)	Ultimate Bearing Capacity (kPa)	Remark
Old Harbour Bay	Sir001	Narine Lane	97.5	292.6	
	Sir002	Fishing Village	118.1	354.4	Water table on 2.2m from ground level
	Sir003	Blackwood Gardens	97.5	292.6	
	Sir004	New Harbour Village	142.5	427.4	
Bog Walk	Sir005	Bog walk	97.5	292.6	
	Sir006	Kent Village	272.6	817.9	
	Sir007	Steep Slope	272.6	817.9	*See Note below.
	Sir008	Dam Head Tower	272.6	817.9	
	Sir009	Angele Round A Bout	142.5	427.4	
Port Maria	Sir010	Castel Garden	192.6	577.7	Water table on 2.2m from ground level
	Sir011	Parish Council	97.5	292.6	
	Sir012	Town Center	50.3	150.9	Water table on 4.5m from ground level
	Sir013	RADA Office	50.3	150.9	*See Note below
	Sir014	Clembhards Park	50.3	150.9	Water table on 2.2m from ground level
	Sir015	Trinity	97.5	292.6	Water table on 7.6m from ground level

*Note: Bearing capacity is presumed from sight because large boring machine cannot enter into narrow site.

Source: JICA Project Team.

3) Road access

The mountain tops where it is planned to construct new radio repeater station huts are accessed by narrow unpaved roads in between 90~120 minutes from the bases of mountains, it was decided to adopt offload trucks equipped with rock boring machines. As for the siren system sites, since these are situated on flatland accessible by ordinary vehicles from public roads, it has been decided to adopt standard boring machines.

1-3 Environmental and Social Consideration

Since the Project entails none of the sectors or characteristics that are likely to impart environmental and social impacts, does not target areas that are prone to impacts, and is deemed will entail hardly any or no negative environmental and social impacts as stipulated in the JICA Environmental and Social Consideration Guidelines (April 2010), it is classified as Category C. The radio equipment to be procured in the Project will be installed inside existing radio repeater stations and the facilities of public agencies, so it will not be necessary to acquire new land or relocate residents and so on.

1-4 Other Points (Global Issues, etc.)

Out of 14 officials in charge of disaster preparedness in Parish Councils, 10 are women (as of

April 2016); indeed, women account for roughly half of the leaders of autonomous groups in the disaster-prone communities that were surveyed by the JICA Project Team. Through the establishment of the disaster radio network in the Project, it is anticipated that women who play an important role in terms of supporting the transmission of disaster information, sharing health and sanitation information within the communities and so on will acquire opportunities to play an even more active role.

Moreover, since disaster-prone areas also happen to be impoverished districts, it is anticipated that implementation of the Project will have a disaster mitigating effect through facilitating rapid evacuation and recovery at times of disaster.

CHAPTER 2 CONTENTS OF THE PROJECT

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

2-1-1 Overall Goal and Project Objectives

The Government of Jamaica has made “Hazard Risk Reduction and Adaptation to Climate Change” one of its development goals based on the Vision 2030 national development plan, and within this it has made “Improve emergency response capability” an important policy goal. Through establishing a nationwide digital radio communication system for disaster prevention, the Project aims to establish the base for realizing fast and stable information conveyance between related agencies and toward the general public when disasters occur. It is thus consistent with the abovementioned development policies of Jamaica and the Government of Japan’s aid policy, hence for Japan there is a high degree of necessity and validity in implementing the Project. Furthermore, against a background of increasingly extensive damage to human lives and infrastructure as a result of natural disasters, it is necessary to address threats to individual dignity, life and lifestyle and from the viewpoint of human security, humanitarian needs can be recognized, and there is also great significance in implementing the Project under the grant aid program from the perspective of addressing global issues.

In light of this background, the overall goal of this Project shall be as follows: “To prepare the environment for mitigating human damage and economic damage at times of disaster occurrence in Jamaica.” The Project goal towards this end shall be to “establish the base for realizing fast and stable information conveyance between related agencies and toward the general public when disasters occur.”

2-1-2 Outline of the Project

In the outline design for the Project, based on the results obtained from the scoping in the first field survey to the detailed site surveys conducted in the second field survey, discussions were conducted with the Jamaican side concerning various aspects of technology, cost, maintenance, etc. and the optimum equipment plan was compiled. Table 2-1-1 shows the contents of the Project assistance, while Figure 2-1-1 gives an outline of the Project.

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1	**Disaster-Emergency Communication System (DECOM)**	
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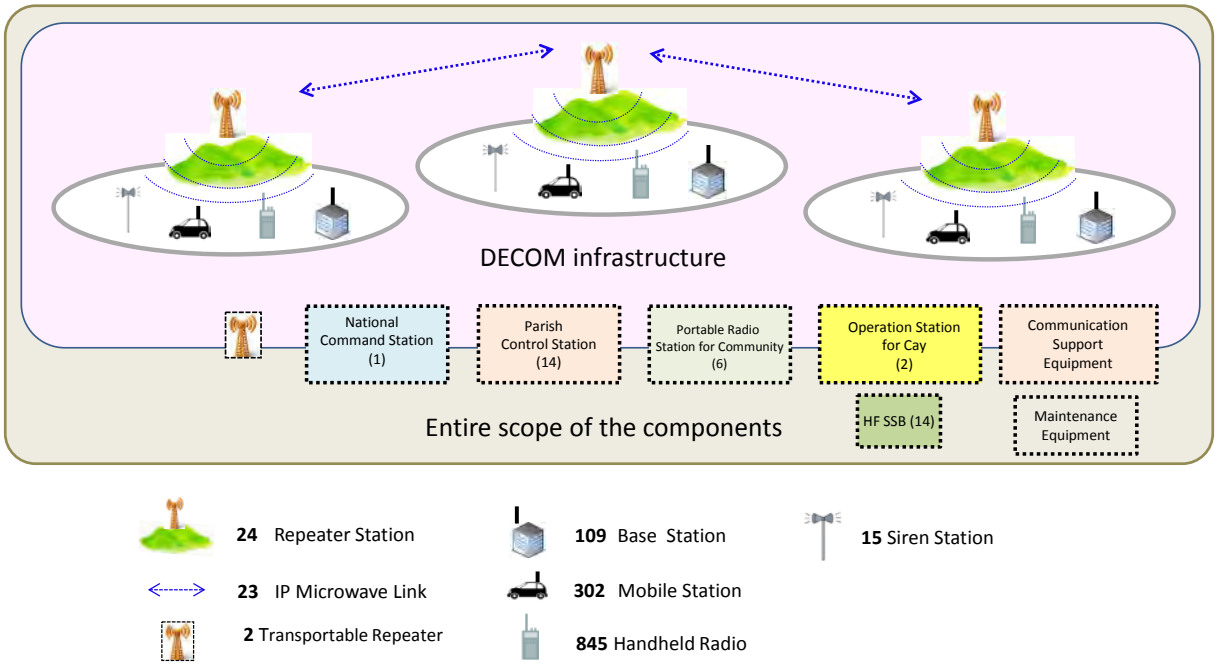
Source: JICA Project Team



Source: JICA Project Team

Figure 2-1-1 Outline of the Project

2-2 Outline Design of the Japanese Assistance

2-2-1 Design policy

2-2-1-1 Basic Policy

As was mentioned earlier, when major disasters or emergencies occur in Jamaica, the main means of communication are analog VHF repeaters that are owned and operated by ODPEM. However, not only does this system lack coverage and communication capacity, but it is increasingly deteriorated and needs to be improved for use in emergency communications. The purpose of Project implementation is to procure and install disaster radio system equipment that covers almost the entire country and possesses adequate communication capacity. Through upgrading the current radio system that is based on analog VHF repeaters, stable means of communication that can be used by disaster prevention agencies even during disasters when normal means of communication such as telephones, etc. are not severed will be realized. Moreover, this system will also be used for firefighting and rescue purposes at normal times, thereby contributing to public safety.

2-2-1-2 Policy regarding Natural Conditions

1) Temperature and Humidity

Jamaica experiences hardly any temperature disparity throughout the year; hence whereas the average temperature in Kingston during the hottest month of July is 29.1°C, it only falls to an average of 26.1°C during the coolest month of February. Since the main items of equipment to be procured in the Project will be used indoors in an air conditioned environment, it will not be necessary to take any special measures regarding outside temperature and humidity. However, regarding design of the indoor temperature, consideration will be given to secure the equipment performance and functions assuming the design outside temperature to be 35°C and the maximum permissible temperature for all equipment to be 40°C.

2) Salt Damage

The radio repeater station huts scheduled for construction in the Project are located on mountain tops, however, many of the sites look out over the ocean and are exposed to ocean winds, and signs of concrete degradation can be seen in places. Accordingly, salt-resistant specifications will be considered for the external walls, openings, air conditioners (outside parts), and other items exposed to outside air.

3) Lightning Strike

The candidate sites of the radio repeater stations in the Project are located on mountain tops that are relatively prone to receiving frequent lightning strikes. In order to address lightning strikes, lightning conductors will be installed on the network systems, and lightning-resistant transformers will be installed on power systems.

4) Seismic Conditions

Jamaican Standard (JS) prescribes considered earthquake and design spectral response accelerations, which is complied with the International Building Code (IBC) of the United States, based on geological feature of each area in Jamaica. There are relatively few records of large earthquakes in Jamaica; however, when designing the radio repeater station huts and siren tower foundations to be constructed and installed in the Project, IBC and Japanese structural standards will be complied with.

5) Wind Conditions

Jamaica is often affected by the hurricane from June to November. Taking into account of the wind speed of past hurricanes and regulation of JS, design wind speed of the structure including radio repeater station huts and siren towers is set to 60 m/s.

2-2-1-3 Policy regarding Social Conditions

In Jamaica, a crime rate such as murder and robbery is high, in comparison with Japan, the murder is about 55 times, robbery is about 38 times, rape is about 30 times and up to near 2,235 times for gunfight in terms of population per 100,000. Much of the local crime is committed in Kingston metropolitan area and its environs. Accordingly, the materials yards, temporary installations, warehouses, etc. during the Project will be soundly guarded. Moreover, while consultants and engineers belonging to the Japanese equipment supplier are assigned to Jamaica, it is desirable that they stay in accommodation facilities that have guarded premises and safe boxes for holding cash and valuables.

2-2-1-4 Policy regarding Construction Conditions

1) Construction Conditions

In Jamaica, public and commercial facilities are medium-size buildings (3~10 stories) comprising reinforced concrete or steel frame structure, while most other buildings tend to be two-story of wood or block structures. The IBC is used as the building standard, while the JS which is prepared based on this standard is used for the other major work categories. Concerning single story houses, the standard execution procedure for concrete block walls is prescribed in the Basic Construction Manual that has been issued by the Incorporated Masterbuilders Association of Jamaica (IMAJ), and a simplified recommended construction standard is disseminated for simple buildings.

Moreover, ODPEM needs to apply for building permission for radio repeater stations three months before the start of work with respect to the Parishes where the sites are located.

2) Procurement of Construction Materials

Procurement of construction materials, laborers and construction heavy machinery in Jamaica

does not entail any particular problems. The quality standards of construction materials conform to the abovementioned IBC and JS. Of the aggregate that is used in concrete and concrete blocks, around 90% comprises limestone crushed stone that can be extracted in Jamaica. However, since limestone aggregate sometimes has erratic quality in terms of water absorption, strength and so on, the concrete and concrete blocks adopted in the Project will be made using gravel and river sand.

Moreover, the mountain tops where it is planned to construct new radio repeater station huts are accessed by narrow unpaved roads in between 90~120 minutes from the bases of mountains. Therefore, since it will be difficult to supply raw concrete within the available time frame of 90 minutes, site-kneaded concrete will be used.

3) Works Environment

In view of the site conditions described above, it is desirable to use small trucks with loading capacity of around 2 tons in order to carry materials. The radio repeater station sites are enclosed by fences and the site land is leveled to an extent. On the other hand, the sites contain other buildings and antenna towers, and although temporary works yards can be secured within the sites, the available space is limited. Accordingly, particularly on the sites that are owned by communications companies, care will be taken to keep the temporary materials yards to a minimum and to plan the transporting of materials. In particular, in cases where concrete works, which use cement, gravel and reinforcing bars, are implemented during the rainy season, it will be necessary to transport materials on an as-needed basis in order to avoid exposure to rain. Moreover, since there are sites where generator oil has been stolen and fences have been broken, theft prevention measures will need to be taken when establishing temporary materials yards inside sites.

2-2-1-5 Policy regarding Procurement Conditions Including Third Countries

Some of the existing VHF analog radio system repeaters and radio terminals are made in Japan and, due to the experience in operating these, there is a high degree of trust in Japanese equipment in Jamaica. Accordingly, Japanese products or products made in DAC-affiliated countries that have high quality and reliability will be adopted for the Project radio equipment, while third country products with a proven track record of use in the respective fields will be adopted for equipment and measuring devices that are not handled by Japanese manufacturers.

Radio communications systems do not function as independent items such as radios and antennas; rather, such systems only display functions when all the component such as repeaters, antennas, power sources, etc. are adjusted comprehensively. Accordingly, based on the basic composition of Project equipment, all the selected equipment items will be coordinated by the Japanese equipment supplier to function as a single system, and the system performance will be assessed and confirmed before shipping and after installation in order to secure the overall system performance and quality.

2-2-1-6 Policy regarding Equipment Grades

Radio equipment for the professional digital trunking system[5] that is planned for procurement in the Project is broadly divided into three types: small-scale, large-scale, and large-scale equipped with high secrecy functions. The large-scale equipment possesses a trunking control channel that can be utilized as a call channel within large-scale trunking systems. The large-scale equipment equipped with high secrecy functions is designed in consideration of the high level of secrecy required in police, military and similar fields. In the Project, since a large-scale trunking radio system for disaster prevention comprising more than 1,000 devices located all over Jamaica will be constructed, the large-scale equipment will be selected. Concerning the secrecy function, this will be sought within the scope that is possessed by the digital system.

2-2-1-7 Policy regarding Equipment Transportation

Features of the Project are that the sites where radio repeater stations and radio equipment will be installed are widely spread around the country in local Parish Councils, police stations, fire stations, hospitals, etc., and that much of the equipment comprises small-size and lightweight radio equipment. Accordingly, it will be important to compile a transportation plan to ensure that once the equipment from Japan (or third countries) has arrived in Kingston, it is certainly and smoothly transported to and stored at the target sites. Figure 2-2-1 shows the equipment transportation plan in the Project.

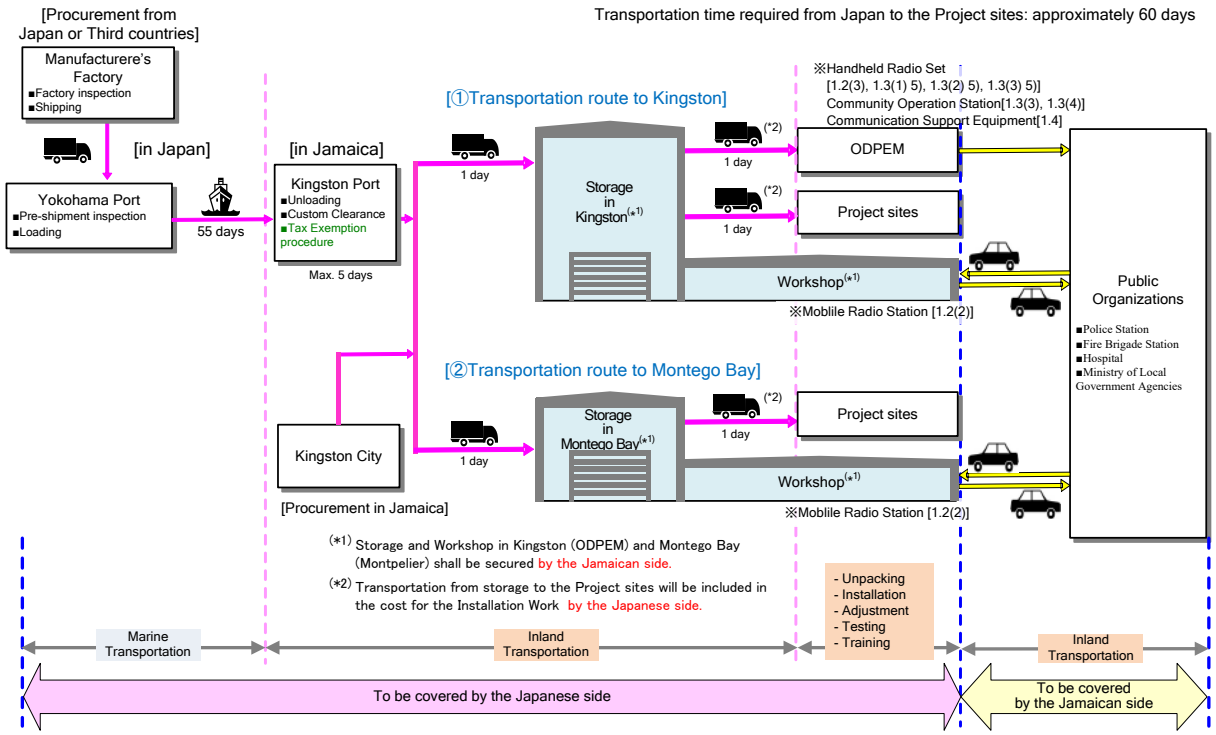


Figure 2-2-1 Plan for Transportation of the Equipment

[5] A communications system in which open channels are automatically searched in two-way radio communications. This is effective in cases where large numbers of users use a limited number of channels.

As is shown above, after being landed at Kingston Port, the equipment will be transported to the warehouse either in Kingston or Montego Bay depending on the target installation, distribution and storage site. In the case of storage in Kingston, the existing warehouse inside ODPEM headquarters will be used, while in the case of storage in Montego, the ODPEM Montpelier warehouse on the outskirts of Montego will be used (see the photographs below).

Storage at ODPEM HQ in Kingston

ODPEM's Storage in Montpelier near Montego Bay

Photograph 2-2-1 ODPEM's Storages

The Japanese supplier will initially store the procured equipment at these two warehouses, functioning as the transportation hubs for the east and west of the country respectively. There, it will classify the equipment according to each target site, and then the Japanese engineers in charge of the installation works will take the initiative in transporting the equipment to each target site. Also, under the initiative of ODPEM, it is planned for public agencies in each area to send vehicles, fire engines, ambulances, etc. to the warehouses so that the Japanese supplier can install mobile radios using the parking spaces adjacent to the warehouses. However, in regional areas, since it may be difficult to send fire engines to the warehouses because the number of vehicles is few compared to the high number of routine dispatches, it will be necessary for the Japanese supplier to visit fire stations to implement installation work as circumstances dictate. As a result of the field surveys, it has been confirmed that the domestic transportation hubs possess sufficient space for implementing the mobile radio installation work. Furthermore, these warehouses can also be utilized as stores for the maintenance equipment and tools and spare parts to be procured in the Project. The Jamaican side will be responsible for securing the above two warehouses and making them available for use.

The procured equipment will be transported by sea from Japan or third countries to Jamaica. It takes approximately 30 minutes by car from Kingston Port to the warehouse at ODPEM headquarters, and a further two and a half hours to the ODPEM Montpelier warehouse on the outskirts of Montego Bay. The roads to these destinations are paved and present no particular problems in terms of the inland transportation. It will take around 60 days to transport the equipment from Japan to the Project sites. Moreover, before the Japanese side starts work on construction of the radio repeater station huts and siren tower foundation works, the Jamaican side will need to secure the siren installation sites and radio repeater station hut sites as well as provide temporary storage areas and waste dumps. To ensure that the Jamaican side can

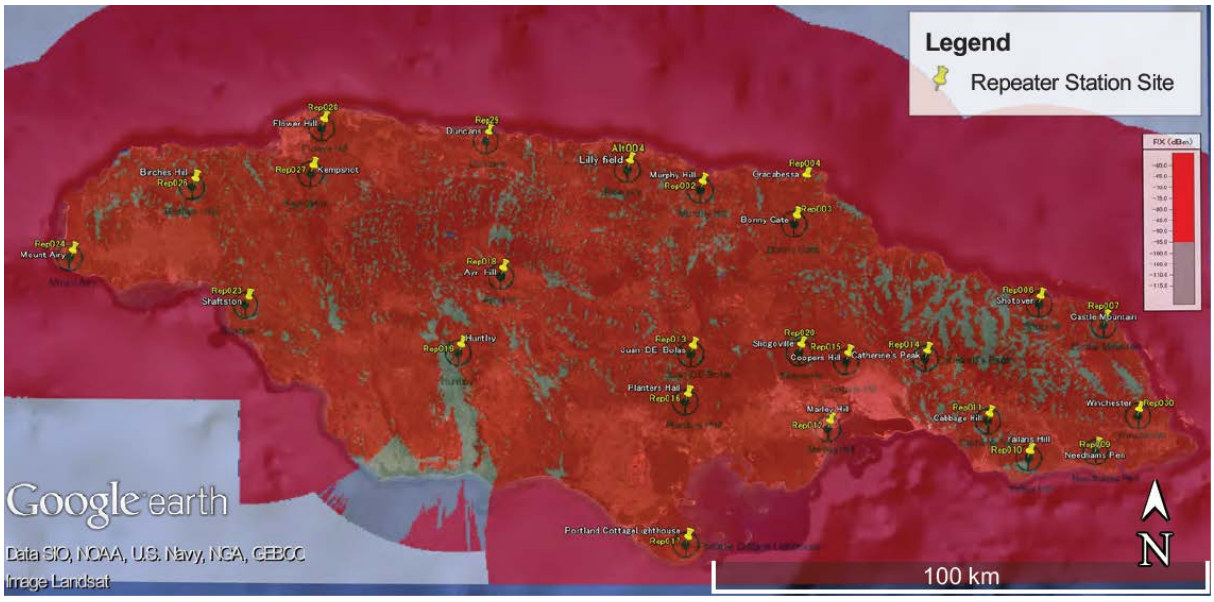
implement its scope of the works without delay, the consultant's work supervisors will conduct appropriate advice and guidance with respect to the counterpart.

2-2-1-8 Policy regarding Works Period

The rainy season in Jamaica usually lasts from May to October. Concerning works when concrete is used for concrete huts, outdoor racks and solar power system foundations, and work is conducted in high places on microwave repeater antenna installation works, the schedule will be planned so that the rainy season is avoided as much as possible with a view to securing the quality of concrete and in consideration of the risk to operators due to strong winds and lightning strikes. Since it will be necessary to hand the procured equipment over to the Jamaican side within 24 months from the signing of the G/A, some of the above works will need to be implemented during the rainy season, however, it is planned to implement above works in order to avoid the period between August and October, when it rains heavily.

2-2-1-9 Policy regarding Layout of Radio Repeater Stations

Based on the results of the wave propagation computer simulation that was implemented by the JICA Project Team in advance, Figure 2-2-2 shows the DECOM coverage according to the results of field strength measurement using test waves transmitted from the 24 radio repeater station sites.



Source: JICA Project Team

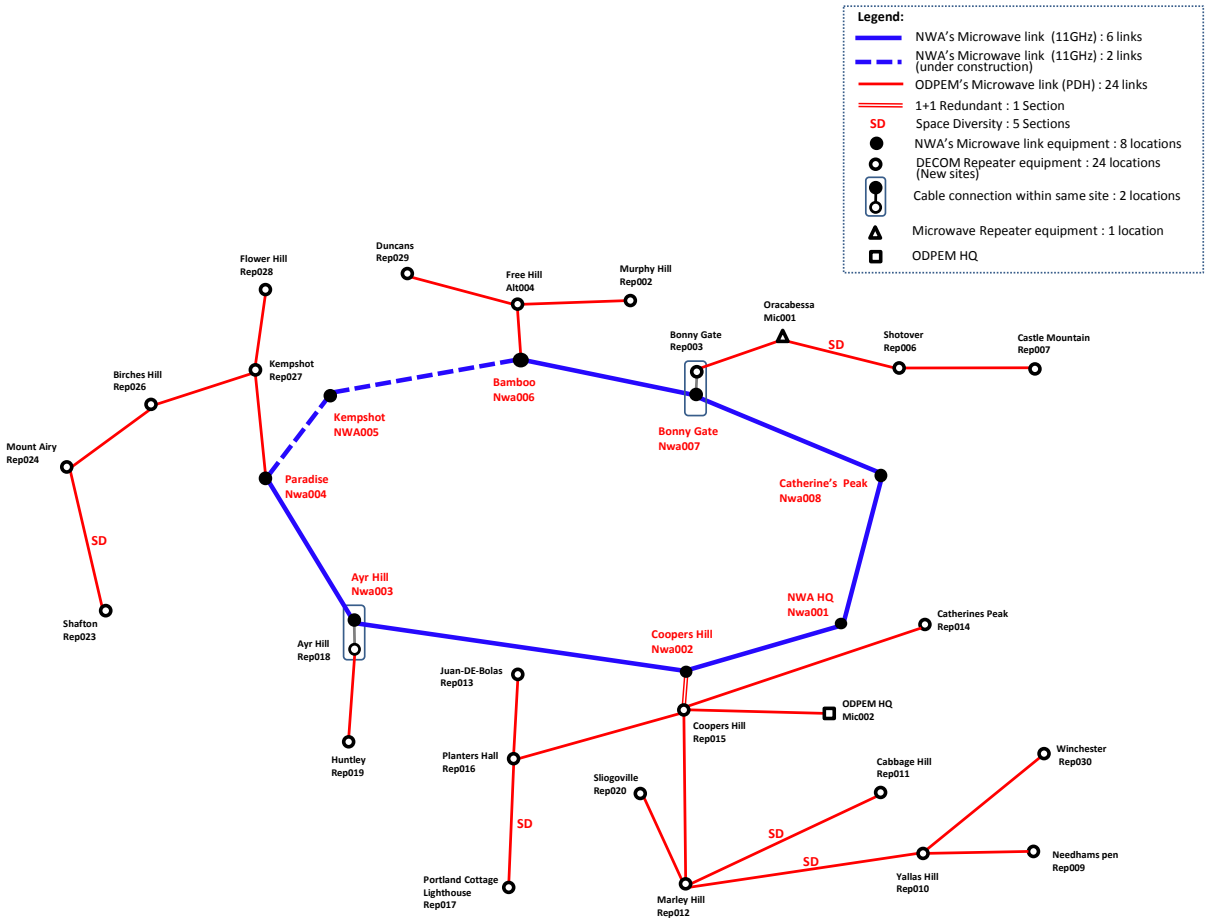
Figure 2-2-2 Coverage after the Project

Each radio repeater station will have three call channels, rising to six in Kingston and environs in consideration of the layout of radio terminals. Moreover, two mobile UHF repeaters will be deployed in order to supplement coverage in areas that are out of range.

2-2-1-10 Policy regarding Connections between Radio Repeater Stations

DECOM will realize a nationwide radio network through inter-connecting each repeater station via an IP network. As is shown in Figure 2-2-3, the IP lines will be realized through effectively utilizing the microwave repeaters to be procured in the Project and the NWA backbone microwave line infrastructure in Jamaica. Thus, Coopers Hill Rep015 will become the Hub in south east area of Jamaica including the capital Kingston, to improve the reliability of the link between Coopers Hill Rep015 and Coopers Hill NWA002, the link will be of redundant type. Then, in consideration of the influence of fading[6] on the microwave repeater antenna, the space diversity[7] antenna will be applied to the sections where needed due to the propagation situation.

Furthermore, the microwave repeater to connect between Bonny Gate Station and Shotover Station only will be installed in Oracabessa Station and the same microwave repeater will be also installed in ODPEM Headquarters to supervise and control DECOM.



Source: JICA Project Team

Figure 2-2-3 Network Diagram of DECOM

[6] Condition where the strength of radio waves fluctuates according to terrain or other factors.
[7] Method for utilizing multiple antennas in order to improve communications reliability

2-2-1-11 Policy regarding Antenna

The UHF radio repeater antennas and microwave repeater parabola antennas in the Project will be installed on the existing towers of each repeater station. Concerning the installation positions, in order to secure the projected coverage of each radio repeater station, the UHF radio repeater antennas will be installed at heights that can avoid nearby obstructions, while the microwave repeater parabola antennas will be installed at heights that secure line-of-sight propagation between antennas. The UHF radio repeater antennas will be installed in quadruple dipole antennas for transmitting and receiving respectively.

2-2-1-12 Policy regarding Construction of Radio Repeater Station Huts

1) Installation/Construction Method

Concerning the method for installing radio repeater station equipment in the Project, the JICA Project Team conducted examination according to the flowchart shown in Figure 2-2-4. As a result, it was confirmed that equipment can be installed inside existing huts at 17 out of 24 repeater stations. As for the remaining 7 stations, due to the deterioration of existing huts and limited space available, it was confirmed as necessary to do the following: ① construct a new concrete hut (6 stations) and ② install an outdoor rack (1 station).

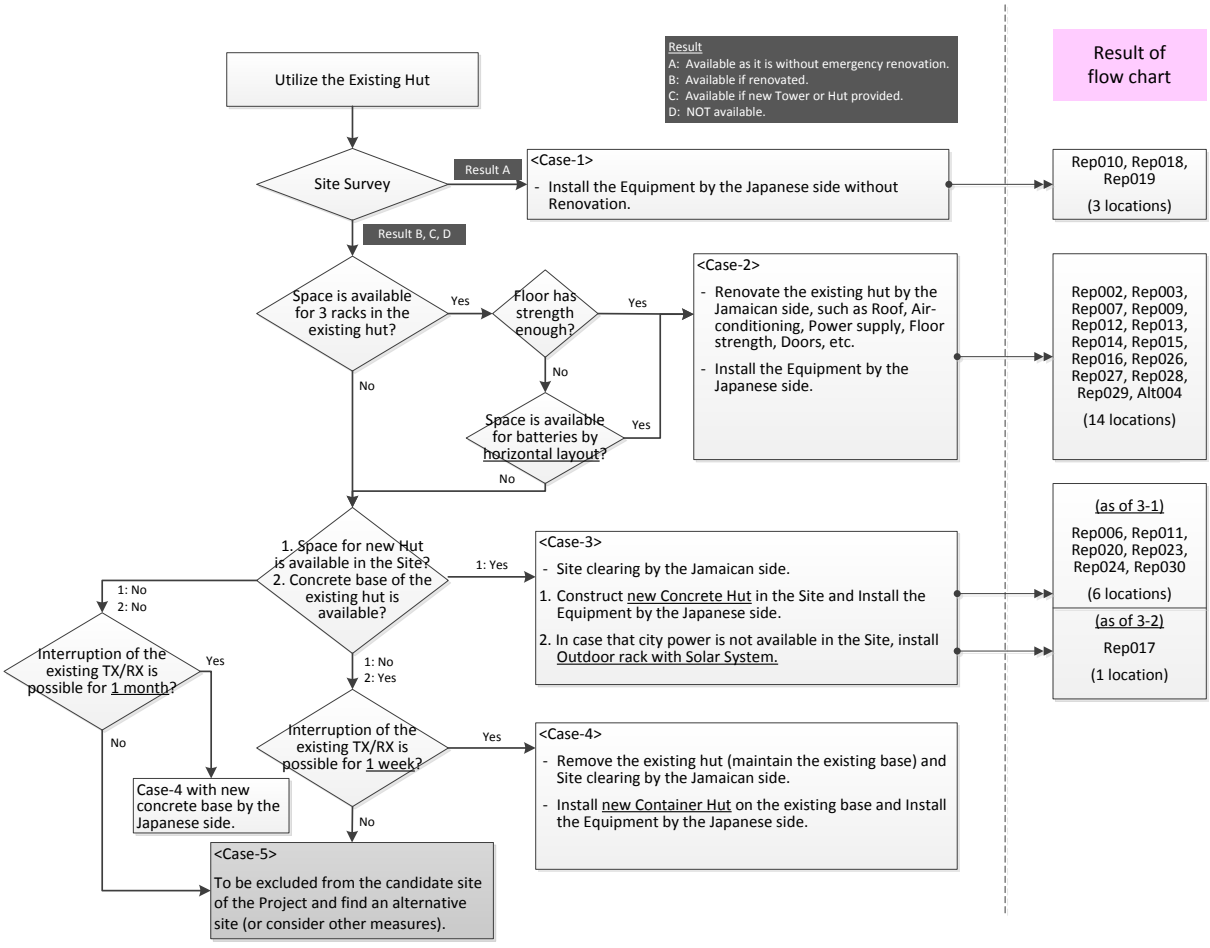
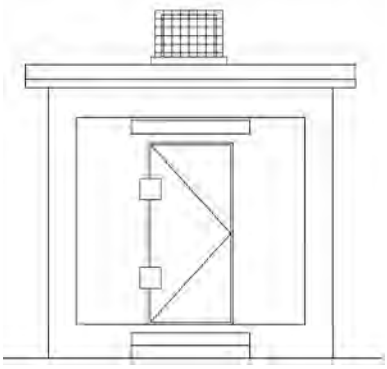


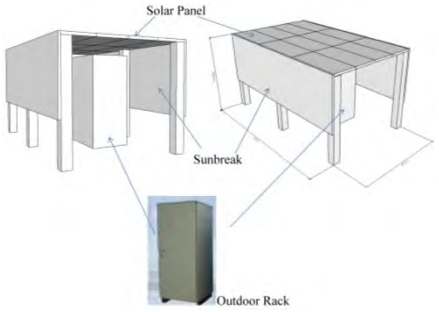
Figure 2-2-4 Flow Chart for Method of Installation of the Equipment in Repeater Station

Table 2-2-1 shows the two approaches to installation and construction of new radio repeater station huts as a result of the above examination.

Table 2-2-1 Installation Method of New Repeater Station Hut

<table>
<tr><th colspan="2">Installation Method</th><th>Site</th><th>Example Figure</th></tr>
<tr><td rowspan="6">[Case 3-1]
Reinforced concrete frame + concrete block wall

(In case a space for new hut is available in the Site.)</td><td rowspan="2">Standard type</td><td>Rep011 Cabbage Hill</td><td rowspan="6">  </td></tr>
<tr><td>Rep023 Shafton</td></tr>
<tr><td rowspan="4">Compact type</td><td>Rep006 Shotover</td></tr>
<tr><td>Rep020 Sliogoville</td></tr>
<tr><td>Rep024 Mount Airy</td></tr>
<tr><td>Rep030 Winchester</td></tr>
<tr><td colspan="2">[Case 4]
Outdoor rack with solar system + concrete foundation

(In case a space for new hut is available in the Site, but city power is not available.)</td><td>Rep017
Portland Cottage Lighthouse</td><td> 
</td></tr>
</table>

Source: JICA Project Team

2) Concrete Huts

Since precision instruments will be installed inside the huts, the newly constructed huts will basically comprise reinforced concrete structure or concrete block masonry structure in some cases to ensure heat insulation and air tightness. Since the local communications company owns the candidate sites for the new huts, but the available space on the candidate sites differs in each case, standard size hut (hereinafter referred to as “Standard type”) is planned to be constructed at two (2) candidate sites with sufficient space. Then, compact size hut (hereinafter referred to as “Compact type”), which has a smaller maintenance space than Standard type, is planned to be constructed at four (4) candidate sites with narrow space.

3) Outdoor Rack

Concerning the target site of Portland Cottage Lighthouse Station, since commercial power supply is not available, a solar power system will be installed. When building the concrete hut, due to power consumption entailed in operating equipment and air conditioning, the area of the solar power system will become too large compared to the scale of the actual hut. Accordingly, an outdoor rack with specifications capable of withstanding the outdoor

environment will be installed; the solar panels will be installed on the roof with a view to limiting temperature increase caused by solar irradiation; and side panels will be fitted to block out the rays of the sun. Foundations will be spread foundations made from reinforced concrete.

2-2-1-13 Policy regarding Power Supply Equipment

The power supply system will comprise emergency power supply equipped on the commercial power supply. Concerning Portland Cottage Lighthouse, which is the only radio repeater station where commercial power supply cannot be obtained, it is planned to construct an independent power supply system based on solar power. As a lightning countermeasure, a lightning-resistant transformer will be installed on the power system.

2-2-1-14 Policy regarding Allocation of Radio Terminals and Radio Base Stations

For nationwide communications purposes, it is planned to allocate 109 fixed radios to government agencies, police stations, fire stations and hospitals, 302 mobile radios for fire department and emergency vehicles, and 845 handheld radios for disaster prevention agencies. Table 2-2-2 shows the destinations for allocation of radio terminals. These quantities are less than the numbers of employees who will need radio communications in the event of emergencies, however, the planning policy is to allocate the minimum necessary devices to ensure that leader-class personnel in each organization can share information in emergencies. In cases where organizations temporarily have shortages of equipment, it is planned to utilize the 10 shared radios that are included among the 25 handheld radios to be allocated to ODPEM headquarters (No. 38 in the table).

Table 2-2-2 List of Radio Terminal Allocated Destinations

No.	Name of Organization	Number of Staffs who need Radio Terminals in Emergency	Number of Radio Terminals			Roles and attributions in disaster management	Terminal distribution policies (Under all telecommunication services failure/suspended)
			Base Radio	Mobile Radio	Handheld Radio		
1	Regional Coordinator	14		4	4	Four regional disaster coordination offices under ODPEM.	1 mobile and 1 handheld for each regional office
2	Kingston & St. Andrew (KSAC) Parish Council	20	1	1	5	Urban city management (Road and public property)	Minimum allocation for activity at PEOC
3	St. Catherine Parish Council	15		1	5	Parish Emergency Operation Center (PEOC)	Minimum allocation for activity at PEOC
4	Clarendon Parish Council	15		1	5	Parish Emergency Operation Center (PEOC)	Minimum allocation for activity at PEOC
5	Manchester Parish Council	15		1	5	Parish Emergency Operation Center (PEOC)	Minimum allocation for activity at PEOC
6	Westmoreland Parish Council	15		1	5	Parish Emergency Operation Center (PEOC)	Minimum allocation for activity at PEOC
7	Hanover Parish Council	15		1	5	Parish Emergency Operation Center (PEOC)	Minimum allocation for activity at PEOC
8	St. James Parish Council	15		1	5	Parish Emergency Operation Center (PEOC)	Minimum allocation for activity at PEOC
9	Trelawny Parish Council	15		1	5	Parish Emergency Operation Center (PEOC)	Minimum allocation for activity at PEOC
10	St. Ann Parish Council	15		1	5	Parish Emergency Operation Center (PEOC)	Minimum allocation for activity at PEOC
11	St. Mary Parish Council	15		1	5	Parish Emergency Operation Center (PEOC)	Minimum allocation for activity at PEOC
12	Portland Parish Council	15		1	5	Parish Emergency Operation Center (PEOC)	Minimum allocation for activity at PEOC
13	St. Thomas PDC Parish Council	15	1	1	5	Parish Emergency Operation Center (PEOC)	Minimum allocation for activity at PEOC
14	Portmore Municipal Parish Council	15		1	5	Parish Emergency Operation Center (PEOC)	Minimum allocation for activity at PEOC
15	St. Elizabeth Parish Council	15		1	5	Parish Emergency Operation Center (PEOC)	Minimum allocation for activity at PEOC
16	Red Cross	100		1	14	Medical services in affected areas	1 mobile for HQ and 1 handheld per Parish Councils
17	Earthquake Unit (UWI)	15	1	1	5	Earthquake observation, Execution of Tsunami Early Warning	1 Base and 1 mobile for HQ, and minimum allocation for shared use among key members.
18	Jamaica Fire Brigade **(JFB)**	400	34	150	250	Fire fighting, Search and Rescue, Ambulance.	Base=Number of fire stations, Mobile=Number of fire engines, Handheld=Number of fire fighters on duty
19	**E.A.R.S.** Emergency Radio Operators	300			100	Skilled emergency radio operators group registered and organized by ODPEM	One third of active and registered members
20	JARA - Jamaica Amateur Radio Association	30			5	Operators belong to JARA. Mainly assist medical activities and shelter management by telecommunication	Minimum allocation to executive members and Headquarter office
21	National Solid Wastes Management Authority	20	1	1	14	handling and processing of disaster debris	Minimum allocation to team leaders headquarter office

No.	Name of Organization	Number of Staffs who need Radio Terminals in Emergency	Number of Radio Terminals			Roles and attributions in disaster management	Terminal distribution policies (Under all telecommunication services failure/suspended)
			Base Radio	Mobile Radio	Handheld Radio		
22	Ministry of Local Govt. HQ (MLGCD)	20	1	1	5	Higher organization of ODPEM	Necessary allocation as a national central organization
23	St. John Ambulance	35			5	Private ambulance service provider	Minimum allocation for maintaining emergency ambulance service
24	Water Resource Authority	25	1	1	10	River management	Minimum allocation to keep organizational missions
25	Western Regional Health Authority	100		30	10	Manage hospitals and dispatch ambulances in the region	Mobile=Number of ambulance, Handheld=Minimum allocation for office staffs
26	Southern Regional Health Authority	100		30	10	Manage hospitals and dispatch ambulances in the region	Mobile=Number of ambulance, Handheld=Minimum allocation for office staffs
27	Montego Bay Marine Park	10		1	5	Major evacuation shelter in the region	Minimum allocation to keep organizational missions
28	NEPA (National Environmental and Planning Agency)	24		1	5	National environmental management	Minimum allocation to keep organizational missions
29	Jamaica Public Service (JPS)	100		4	30	Electric Power provider. Designated organization as a national disaster management. Site's owner of DECOM's repeater sites	Minimum allocation for keeping communication with PEOC and ODPEM. Handheld = (3/each regional maintenance office)*10
30	Meteorological Service	20	1	2	12	Weather observation and forecast	Minimum allocation to keep organizational missions
31	Airports Montego Bay and Kingston	35		2	10	Airport management	Minimum allocation to keep organizational missions
32	National Water Commission	18			5	Public water supply	Minimum allocation to keep organizational missions
33	National Work Agencies	30	1	2	14	Public works (Road management)	Handheld= 1/each Parish Councils
34	Office of The Prime Minister	10		1	5	The Prime Minister's office	Minimum allocation to keep organizational missions
35	Port Authority of Jamaica (PAJ)	40		2	10	Port administration, control and operation	Approximate one third of number of staffs who need radios
36	Jamaica Urban Transit Company (JUTC)	60			20	Transportation management for relief and recovery	Approximate one third of number of staffs who need radios
37	Shelter Managers	156			50	Evacuation shelter management	Approximate one third of major evacuation shelter (156)
38	ODPEM HQ (National Emergency Operations Center)	40		5	25	National Emergency Operations Center	Mobile=Emergency vehicles in ODPEM, Handheld=Core staffs in ODPEM (15)+ National common terminal (10)
39	Ministry of Labor, Social Security (MLSS)	25		1	10	Control disaster relief duties of the victims.	Minimum allocation to keep communication with PEOC and ODPEM. Approximate one third of number of staffs who need radios
40	Ministry of Education	50			20	Management of school assets as a evacuation shelter. Management of school students.	Minimum allocation to keep communication with PEOC and ODPEM. Approximate one third of number of staffs who need

No.	Name of Organization	Number of Staffs who need Radio Terminals in Emergency	Number of Radio Terminals			Roles and attributions in disaster management	Terminal distribution policies (Under all telecommunication services failure/suspended)
			Base Radio	Mobile Radio	Handheld Radio		
							radios
41	Jamaica Constabulary Force (**JCF**)	70	37		37	Public security, traffic control and management. They have their own police radio however, they need DECOM terminal to communicate with NEOC, PEOC and other disaster relief agencies.	1 Base and 1 handheld for each Major police office
42	Ministry of Health	100	30	5	30	Treatment of injured or sick person. To communicate with regional health authorities and ambulances.	Base and handheld = Number of key hospitals Mobile = Number of staffs on duty in the ministry
43	AEROTEL / JCAA	30		1	10	Jamaica Civil aviation Authority and its subsidiary, also site owner of DECOM repeater sites	Approximate one third of number of staffs who need radios to communicate with NEOC and PEOC
44	Ministry of Tourism	25			5	Emergency management in tourism and accommodation facilities	Minimum allocation to keep organizational missions
45	Petrojam	20			5	Semi government organization for national oil and fuel supply	Minimum allocation to keep organizational missions
46	Digicel (Telecom service provider)	15			5	Mobile communication service provider, also site owner of DECOM repeater sites。	Minimum allocation to keep communication with PEOC and ODPEM. Approximate one third of number of staffs who need radios
47	FLOW (Telecom service provider)	15			5	Mobile communication service provider, also site owner of DECOM repeater sites。	Minimum allocation to keep communication with PEOC and ODPEM. Approximate one third of number of staffs who need radios
48	Department of Corrections	20			5	Management of correction and prison facilities	Minimum allocation for keeping organizational missions
49	South East Regional Health Authority	100		30	10	Management of hospitals and dispatch ambulances in the region	Mobile=Number of ambulance, Handheld=Minimum allocation for office staffs
50	Maritime Authority	15		1	5	Relief and recovery management for fishery industry	Minimum allocation to keep organizational missions
51	Ministry of Agriculture	15		1	5	Relief and recovery activity for farmers and implement disaster assessment	Minimum allocation to keep organizational missions
52	TV and radio broadcasters, Jamaica Information Service (JIS)	30		10		Mass media, Information dissemination of early warning and disaster information to communities/residents	1 mobile for each key broadcaster (9 in total), 1 mobile for JIS. To be installed as base station.
Sub total		2,447	109	302	845		
			Total		**1,256**		

Source: ODPEM

The national command radio base station will be installed in NEOC (ODPEM), and Parish radio base stations will be installed in 14 Parish Councils. The radio base stations will serve as bases for transmitting communications over the entire country and acting as links for communications on the Parish and community levels.

Concerning the allocation of fixed radio terminals and fixed base stations, it will be essential to secure definite communications with the DECOM repeater stations. The JICA Project Team checked the field strength at all candidate sites according to the list of installation sites provided by ODPEM and confirmed the fixed radio terminal installation environments and appropriate antenna installation sites. In doing so, the team confirmed that definite communications can be secured from the DECOM radio repeater stations.

Concerning communications on the Parish and community levels, two mobile community radio stations each that can be operated in affected areas during disasters will be allocated to three counties (Cornwall, Middlesex, and Surrey), and they will be transported to affected areas when disasters occur, thereby enabling communications with the radio base stations in the Parish Councils. Concerning Pedro Cay and Morant Cay, one waterproof community radio base station each (mobile, for carrying to remote islands) will be allocated.

2-2-1-15 Policy regarding Communication Support Equipment

Concerning communication support equipment, in order to complement the UHF radio network, interfaces will be established with existing maritime and aviation radio systems.

2-2-1-16 Policy regarding Installation of Early Warning System

The siren systems for giving evacuation warnings will be allocated to a total of 15 sites in three areas through utilizing the DECOM radio network. Table 2-2-3 shows the siren system candidate sites.

Table 2-2-3 Candidate Sites of Siren System

No.	Parish	Area	Name of Candidate		Number
1	St. Catherine	Old Harbour Bay	Sir001	Narine Lane	4
			Sir002	Fishing Village	
			Sir003	Blackwood Gardens	
			Sir004	New Harbour Village	
2	St. Catherine	Bog Walk	Sir005	Bog walk	5
			Sir006	Kent Village	
			Sir007	Steep Slope	
			Sir008	Dam Head Tower	
			Sir009	Angele Round A Bout	
3	St. Mary	Port Maria	Sir010	Castel Garden	6
			Sir011	Parish Council	
			Sir012	Town Center	
			Sir013	RADA Office	
			Sir014	Clembhards Park	
			Sir015	Trinity	
			Total		15

Areas of the candidate of Siren System

Old Harbour Bay

Bog Walk

Port Maria

Photograph 2-2-2 Locations of Candidate Sites of Siren System

2-2-1-17 Outline of the Project Component

Figure 2-2-5 shows an outline of the Project Component and Table 2-2-4 shows the purpose of each of the equipment that will be used in the Project.

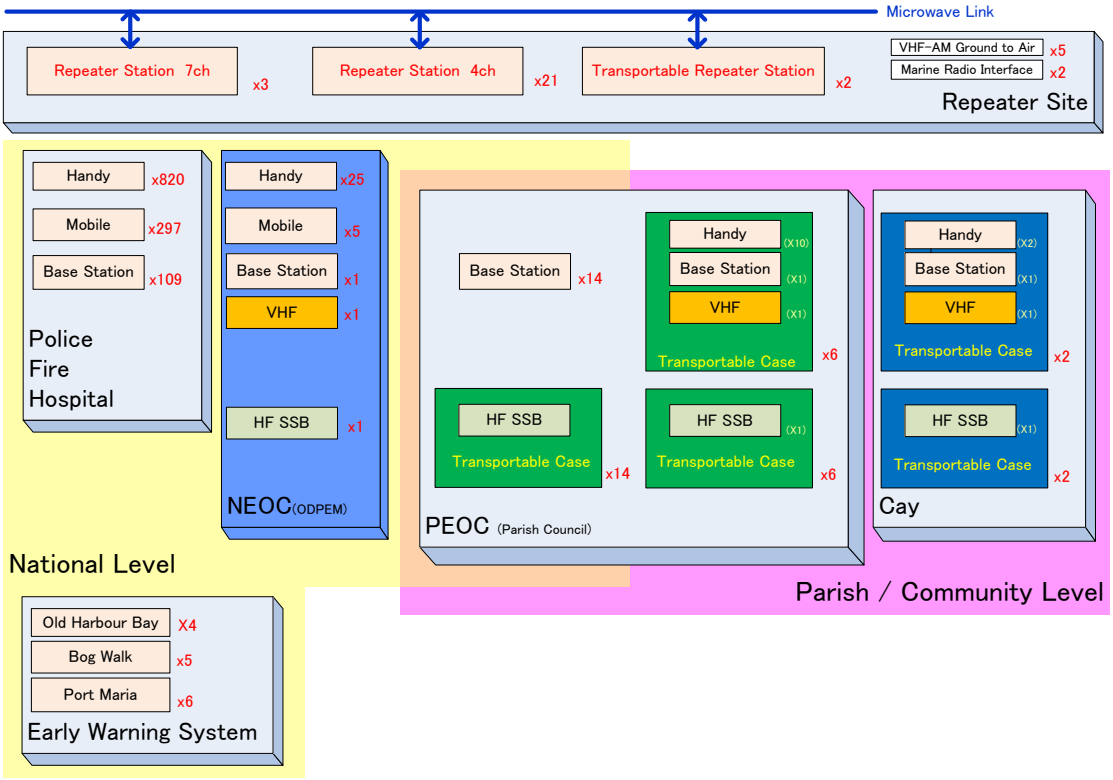


Figure 2-2-5 Outline of the Project Component

Table 2-2-4 Classification of Radio Communication System

Category	Purpose and Applications
DECOM (UHF)	DECOM is a Digital Trunking Radio system with UHF Frequency consisting of Repeater stations, Base stations, Mobile radios Handheld radios which are deployed on all over Jamaica. Coverage of the system will cover most of Jamaica as Fig 2-2-2. In case of emergency situation at the outside of the coverage, two sets of Transportable UHF Repeater Station will be used.
VHF	VHF Radio system is an analog radio two-way communication system. Existing VHF Radio system consists of Base Radio station, Repeater station and Handy terminal which are loaded on boats, air plane and so on. Interface which will be deployed in this project between DECOM system and Existing analog VHF system will make it possible to promote wide area radio communication service including existing system.
HF SSB	HF SSB is a voice radio two-way communication system with HF band frequency. In case of disaster like hurricane, simplex communication of HF SSB will be caused smaller damage than communication system with Repeater station. HF SSB with wide coverage and long communication distance will be effective as backup system of UHF communication system.

Source: JICA Project Team

2-2-2 Basic Plan (Equipment Plan)

2-2-2-1 Design Conditions

1) Weather and Site Conditions

① Site altitude (altitude above sea level)

・Radio repeater station: 1,504 m (Catherine's Peak: highest of all sites)

② Temperature (annual mean)

・Low temperature: 24.0°C

・High temperature: 30.8°C

③ Humidity (annual mean): 81%

④ Wind velocity: 60m/s (design wind velocity)*1

⑤ Rainy season: May to October

⑥ Hurricane season: June to November

⑦ Mean rainfall (monthly mean) 74.5 mm

⑧ Power source: AC 110 V (single phase), 50 Hz

*1: Quoted from the JS

2) Applicable Standards

Table 2-2-5 Applicable Standards

	Name of Standard	Application
(a)	International Electrotechnical Commission (IEC)	Main functions of electrical goods in general
(b)	International Standardization Organization (ISO)	Performance of industrial products in general
(c)	Japanese Industrial Standards (JIS)	Industrial products in general
(d)	Japanese Electrotechnical Commission (JEC)	Electrical goods in general

	Name of Standard	Application
(e)	The Standard of Japan Electrical Manufacturer's Association (JEM)	Same as above
(f)	Japan Electric Association Code (JEAC)	Same as above
(g)	Japan Cable Makers' Association Standard (JCS)	Electrical wires and cable
(h)	Electrical Industrial Association of Japan (EIAJ)	Electrical goods in general
(i)	International Telecommunication Union (ITU)	Electrical goods in general
(j)	International Civil Aviation Organization (ICAO)	Antenna Pole
(k)	Electronic Industries Alliance of the U.S.A (EIA)	Same as above
(l)	Japanese Building Code and Standards	Building design
(m)	International Building Code (IBC)	Building design
(n)	Jamaican Standards (JS)	Building design

2-2-2-2 Building Plan (Radio Repeater Station Hut)

1) Plan Outline

Room sizes inside the radio repeater station huts in the Project have been determined on condition that the minimum required area for the equipment to be installed is secured. Table 2-2-6 shows the plan outline of the radio repeater station huts.

Table 2-2-6 Outline of New Repeater Station Hut

Outline		
Reinforced concrete frame + concrete block wall	(1) Area:	Standard type; 12.0m^2 Compact type; 8.0m^2
	(2) Height:	GL + 3.35m
	(3) Structure:	Reinforced concrete single story with concrete block wall
	(4) Building Service:	Electrical, Lighting, Ventilation
Outdoor rack with solar system + concrete foundation	(1) Outdoor rack ・Steel rack for weather proof ・Three equipment racks shall be stored inside (2) Solar system ・Galvanized Frame	

Source: JICA Project Team

2) Structural Plan (Concrete Hut)

The structural form of the concrete huts will comprise reinforced concrete, rigid-framed, single story structures. In all candidate sites, foundation can be isolated because these grounds were found to comprise mainly limestone and there is no risk of subsidence or land slide. Furthermore, the design of foundation should be common to all six (6) locations for the efficiency of the construction work to be executed at those locations in parallel. In outline design, foundation level is set on one (1) meter down from the existing ground level. Bearing capacity for outline design is 100kN/m^2 as typical value in Japanese Building Code and

Standards to consider safety factor.

3) Finishing Plan (Concrete Hut)

In order to control the room temperature due to the heat radiation from equipment, the rooms will be equipped with air conditioners. Moreover, concrete roofs and external concrete block walls will be adopted to enhance heat insulation and air tightness of the rooms. Because Jamaica is an island country surrounded by ocean, stainless steel doors will be adopted for exterior fittings in consideration of resistance to salt damage.

2-2-2-3 Equipment Plan

1) Radio Repeater Stations

As is shown in Figure 2-1-1 and Table 2-1-1, the radio repeater stations will be installed at 24 sites throughout the country. In the large-scale digital trunking system that is planned in the Project, in addition to call channels, one trunking control channel will be secured at each station, making it possible to form call groups according to the operation and to use only the channels of the repeater stations of the radios being used on calls. This is indispensable for conducting wide area operations with a limited number of call channels.

Each radio repeater station in the Project will have a basic composition of three call channels and one control channel (four channels in total). However, concerning the three radio repeater stations (Coopers Hill Station, Catherin's Peak Station, and Marley Hill Station) in the capital Kingston and environs, the composition will be seven channels comprising six call channels and one control channel in order to realize stable communications amidst high demand and secure redundancy, which is important in disaster prevention radio.

As was shown in Figure 2-2-2, radio repeater stations will be inter-connected by the microwave repeater antennas to be procured in the Project, and the nationwide wireless network will be constructed through the NWA trunk IP microwave line backbone. Due to renewal of the existing steel tower at Kempshot Station, the NWA trunk IP microwave line that is denoted by the staggered line in Figure 2-2-3, the NWA trunk IP microwave line is not connected, however, when this section is opened, it is anticipated that the loop system will be completed and reliability of DECOM will be enhanced. Both networks will be connected via network switches to be procured in the Project at five NWA trunk IP microwave line repeater stations.

In the UHF radio system, securing the envisaged coverage from radio repeater station antennas is important in terms of enhancing receiving sensitivity. In particular, obstructions close to antennas have a negative impact on receiving sensitivity. As a result of the field surveys, the positions for installing UHF antennas on the radio repeater station candidate sites were as indicated in Table 2-2-7.

Table 2-2-7 Radio Repeater Stations of DECOM

Repeater Stations		Location (GPS Receiver Data)		Height (ASL)	Number of Channels	Tx Power (W)	Tx Antenna Gain (dBi)
Code	Name	Longitude DD°MM'SS.S"	Latitude DD°MM'SS.S"	Google Earth Data (m)			
Rep002	Murphy Hill	18°22'58.3"N	77°07'45.5"W	506	4	50	6
Rep003	Bonny Gate	18°19'17.2"N	76°57'00.0"W	481	4	50	6
Rep006	Shotover	18°10 '24.7"N	76°29'02.1"W	319	4	50	6
Rep007	Castle Mountain	18°08 '07.8"N	76°21'38.9"W	322	4	50	6
Rep009	Needhams Pen	17°54'16.1"N	76°22'42.0"W	231	4	50	6
Rep010	Yallas Hill	17°53'43.2"N	76°30'21.1"W	674	4	50	6
Rep011	Cabbage Hill	17°57'46.5"N	76°34'57.4"W	976	4	50	6
Rep012	Marley Hill	17°57'04.0"N	76°53'14.4"W	164	7	50	6
Rep013	Juan-DE-Bolas	18°05'14.1"N	77°08'51.9"W	822	4	50	6
Rep014	Catherine's Peak	18°04'37.9"N	76°42'09.8"W	1511	7	50	6
Rep015	Coopers Hill	18°04'23.7"N	76°51'08.7"W	759	7	50	6
Rep016	Planters Hall	17°59'59.9"N	77°09'29.8"W	381	4	50	6
Rep017	Portland Cottage Lighthouse	17°44'32.2"N	77°09'27.2"W	156	4	25	6
Rep018	Ayr Hill	18°13'35.6"N	77°30'23.0"W	979	4	50	6
Rep019	Huntley	18°05'20.8"N	77°35'17.8"W	918	4	50	6
Rep020	Sliogoville	18°05'20.7"N	76°56'28.5"W	657	4	50	6
Rep023	Shafton	18°10'21.8"N	77°59'31.7"W	758	4	50	6
Rep024	Mount Airy	18°15'20.3"N	78°19'44.7"W	131	4	50	6
Rep026	Birches Hill	18°23'11.2"N	78°05'47.8"W	513	4	50	6
Rep027	Kempshot	18°24'39.3"N	77°52'09.2"W	537	4	50	6
Rep028	Flower Hill	18°29'40.5"N	77°50'56.7"W	410	4	50	6
Rep029	Duncans	18°28'19.0"N	77°32'10.0"W	150	4	50	6
Rep030	Winchester	17°58'10.0"N	76°17'47.6"W	539	4	50	6
Alt004	Free Hill	18°25'12.4"N	77°16'02.5"W	560	4	50	6

Source: JICA Project Team

When commercial power is interrupted to radio repeater stations, emergency power sources based on batteries will be secured. Extended period battery power sources enhance the system reliability, however, because the volume and weight of batteries increase, it becomes necessary to set the emergency power supply time upon considering available space, frequency of power interruptions, geographical conditions and so on.

In the Project, in case there is a backup by the generator to the commercial power supply, the backup time is set to 24 hours by the battery as a preparation time for the out of fuel, generator trouble etc., Generally in Jamaica, a recovery time from a power failure in radio repeater station is within 24 hours. In case there is no backup by the generator to the commercial power supply, considering situations where it is difficult to restore the commercial power supply within 24 hours, the standard backup time utilizing batteries will be set at 36 hours based on the assumption that fuel is replenished in existing fuel tanks or an emergency generator is set up during the battery power supply time (also considering the time it takes to reach the radio repeater stations). However, backup time of 48 hours will be secured in the cases of Birches Hill Station, which experiences frequent interruptions to the commercial power supply but has no emergency power supply, and Shafton Station, which has poor access and takes time to

reach. Also, at Portland Cottage Lighthouse Station, which has no commercial power supply, a solar independent power system will be installed. Since solar power generation has smaller generating output than diesel generation, etc., considering load mitigation and the minimum required coverage, the generating capacity of solar panels will be planned assuming transmitting output of 25W and continuous non-sunlight time of 72 hours. Also, outdoor racks will be fitted underneath the solar panels, and a natural cooling system that normally doesn't utilize air conditions and limits temperature increase caused by direct sunlight will be planned. However, to ensure the safety of equipment at times when temperature inside the racks increases abnormally, an air conditioning driven by a generator will be installed in the outdoor rack for emergency use.

In the Project, it is planned to install a wireless management system in ODPEM headquarters for monitoring all 24 repeater stations in the country. The system will monitor the transmission output of each transmitting channel, VSWR in the transmission antennas, battery voltage, open doors and so on.

As a method of use other than radio terminal calling, a GPS positional information system is planned. It is planned to equip GPS receivers to the mobile radios to be provided in the Project and to build a system for consolidating GPS positional information to a server via radio and displaying it on a map. It is anticipated that positional information of fire engines, ambulances, etc. can be effectively utilized when conducting rescue operations during disasters.

2) Radio Terminals

To enable nationwide communications, 109 fixed radios will be installed in government agencies, police stations, fire stations and hospitals. As standard specifications, these will be equipped with emergency power batteries and non-directional antenna, however, concerning the sites that are situated in mountain areas, advantageous Yagi antennas will be installed. Since the available space for installing radio terminals is limited in many cases, the radio terminals will be separated from the control panels, and wall-fitted terminals will be adopted when desk installation is difficult. Concerning the firefighting vessels in Ocho Rios and Kingston, power will be supplied from shipping batteries via a DC/DC converter.

Mobile radios will be fitted in large fire engines and emergency vehicles (magnetic mounted antennas and glass mounted antennas). For large fire engines, DC/DC converters will be installed with the 24V vehicle batteries.

Concerning handheld radios, standard sets comprising radio and chest holder; mobile sets comprising external speaker, eternal antenna, and cigar socket DC power cable; and explosion-poof radios will be supplied.

3) Radio Base Stations

The national command radio base station will be equipped with one HF-SSB fixed radio

system, one VHF fixed radio system, one UHF fixed radio system and handheld radios. For the fixed radio systems, emergency power supply comprising batteries (20 hours) and generators will be installed together with portable 140W solar power systems for auxiliary power supply.

At the Parish radio base stations, HF-SSB portable radios and UHF fixed radios will be installed together with emergency batteries for use during power interruptions.

The community portable radio stations will comprise HF-SSB portable radios, VHF fixed radios, UHF fixed radios, and portable radio stations equipped with handheld radios (stored inside hard cases). When disasters occur, the portable radio stations will be transported to affected areas and used for enabling communications between the Parishes and communities. Moreover, two radio stations supplied to remote islands (Pedro Cay and Morant Cay) will be equipped with waterproof hard cases, long antenna poles (10m) and Yagi antennas.

4) Communication Support Equipment

In order to augment the DECOM UHF radio network at times of disaster, maritime radio interfaces and VHF-AM ground to air radio repeaters are planned. At the five sites of Coopers Hill Station, Flower Hill Station, Shotover Station, Murphy Hill Station and Shafton Station, VHF-AM ground to air radio terminals and IP network gateways will be provided, and connections with ODPEM headquarters will be made possible through microwave repeater antennas procured in the Project.

Concerning the maritime radio interfaces, the IP network gateways procured in the Project will be installed on the existing VHF maritime radio repeaters installed at Catherine's Peak Station and Shafton Station, and like the VHF-AM ground to air radios, they will be connected to ODPEM headquarters through microwave repeater antennas.

5) Early Warning System (Siren System)

The siren system will entail inputting the control code via the number keys on the DECOM radio terminal in order to issue alarms from sirens installed in 15 disaster-prone areas. The activation method will be the same as that currently adopted in the existing analog VHF radio siren system at ODPEM. The power supply system will be the independent type based on solar panels installed at the siren towers.

6) Maintenance Equipment and Tools

The minimum required measuring devices and special tools for conducting routine maintenance inspections of the radio repeaters, antenna systems, radio terminals, etc. in the Project will be procured.

7) Spare Parts

Spare parts will mainly comprise parts, antennas and other outdoor installed components that could interrupt operations in the event of failure.

8) Technical Support

The Japanese supplier will warrant the procured equipment to ODPEM as executing agency for a period of one year after the installation work. In addition to the warranty, the Japanese supplier will provide technical consultation (off-site) for two years after the installation work.

2-2-3 Outline Design Drawings

Table 2-2-8 shows the composition of radio communications equipment targeted in the Project.

(1) Equipment Composition

Table 2-2-8 List of the Equipment

No.	Item	Q'ty
1	**Disaster-Emergency Communication System (DECOM)**	
1.1	Radio Repeater Station	
(1)	Fixed UHF Repeater Station (4ch)	21 sets
(2)	Fixed UHF Repeater Station (7ch)	3 sets
(3)	Transportable UHF Repeater Station	2 sets
(4)	Microwave Link	1 lot
1)	Long Range	5 sets
2)	Short Range	14 sets
3)	Long Range with Diversity	5 sets
4)	Short Range (Transportable Type)	2 sets
(5)	Power Supply System	1 lot
1)	For Fixed UHF Repeater Station (4ch)	17 sets
2)	For Fixed UHF Repeater Station (4ch) with Large Capacity	3 sets
3)	For Fixed UHF Repeater Station (4ch) with Solar backup	1 set
4)	For Fixed UHF Repeater Station (7ch)	3 sets
5)	For Transportable UHF Repeater Station	2 sets
6)	DC-DC Converter for Microwave Link	46 pcs
7)	AC/DC48V Power Supply Unit for Microwave Link	4 pcs
8)	AC/DC48V Power Supply Unit for Microwave Link with UPS	1 pc
(6)	Radio Management System	1 lot
(7)	GPS Location Management System	1 lot
(8)	NWA Network Connection System	5 sets
(9)	Equipment Rack	1 lot
1)	19in Rack	4 pcs
2)	19in Rack (Space-Saving Type)	43 pcs
3)	Battery Rack	23 pcs
4)	Outdoor Rack	1 set
1.2	Two-Way Radio Terminal	

No.	Item	Q'ty
(1)	Base Radio	107 sets
(2)	Base Radio (Marine Type, DC24V)	2 sets
(3)	Mobile Radio	1 lot
1)	For Fire Engine	100 sets
2)	For Passenger Vehicle (Magnet Mount Antenna Type)	151 sets
3)	For Passenger Vehicle (Window Mount Antenna Type)	51 sets
(4)	Handheld Radio	1 lot
1)	Handheld Radio (Standard Set)	225 pcs
2)	Handheld Radio (Mobile Radio Set)	500 pcs
3)	Handheld Radio (IS Type)	120 pcs
1.3	Integrated Command and Control Station	
(1)	National Command Station	1 lot
1)	HF-SSB (type A)	1 pc
2)	VHF Base Radio (type A)	1 pc
3)	UHF Base Radio (type A)	1 pc
4)	Power Supply System (type A)	1 set
(2)	Parish Control Station	14 lots
1)	HF-SSB (type B)	1 pc
2)	UHF Base Radio (type B)	1 pc
3)	Power Supply System (type B)	1 set
(3)	Portable Radio Station for Community	6 sets
1)	HF-SSB (type C)	1 pc
2)	VHF Base Radio (type C)	1 pc
3)	UHF Base Radio (type C)	1 pc
4)	Power Supply System (type C)	1 set
5)	Handheld Radio (type C)	10 pcs
(4)	Operation Station for Cay	2 sets
1)	HF-SSB (type D)	1 pc
2)	VHF Base Radio (type D)	1 pc
3)	UHF Base Radio (type D)	1 pc
4)	Power Supply System (type D)	1 set
5)	Handheld Radio (type D)	2 pcs
1.4	Communication Support Equipment	
(1)	VHF-AM Ground to Air Radio Repeater	5 pcs
(2)	VHF-FM Marine Radio Remote Interface	2 pcs
(3)	Ground to Air/Marine Radio Terminal	1 pc
(4)	Ground to Air Radio	2 pcs
(5)	Marine Radio	2 pcs
2	**Early Warning System (EWANS)**	
2.1	Siren System	15 sets
2.2	Siren Tower	10 sets
2.3	Siren Mast	5 sets
3	**Maintenance Equipment and Tools**	
3.1	Workshop Maintenance Tools	2 sets
3.2	Field Maintenance Tools	4 sets
3.3	Radio Monitor (Portable)	1 pc
3.4	SWR Power Meter (HF)	1 pc
3.5	SWR Power Meter (VHF/UHF)	1 pc

No.	Item	Q'ty
3.6	Measuring Kit	1 set
4	**Spare Parts** (UHF Repeater Main Unit, UHF Repeater Power Unit, UHF Repeater Control Unit, AC/DC Power Supply, Layer3 Switch, Antenna for Two-way Radio Terminal, etc.)	**1** lot

(2) Outline Design Drawings

The outline design drawings for the equipment targeted in the Project are indicated in Table 2-2-9. Refer to Appendix 8 for the outline design drawings.

Table 2-2-9 Outline Design Drawings

Dwg No.	Dwg Title
G-01	Locations of the Project sites
DS-01	Over All of DECOM System
DS-02	Network Diagram of DECOM
DS-03	Block Diagram of Fixed UHF Repeater Station (4ch)
DS-04	Block Diagram of Fixed UHF Repeater Station (7ch)
DS-05	Block Diagram of Transportable UHF Repeater Station
DS-06	Appearance of Transportable UHF Repeater Station
DS-07	Block Diagram of Power Supply System for Fixed UHF Repeater Station (4ch)
DS-08	Block Diagram of Power Supply System for Fixed UHF Repeater Station (4ch) with Solar Backup (Portland Cottage Lighthouse)
DS-09	Outside View of Frame for Solar Panels
DS-10	Block Diagram of Power Supply System for Fixed UHF Repeater Station (7ch)
DS-11	Block Diagram of Power Supply System for Transportable UHF Repeater Station
DS-12	Block Diagram of Power Supply System for Microwave Link Repeater Station
DS-13	Block Diagram of NWA Network Connection System/NWA Power Supply System
DS-14	Rack Arrangement for Fixed UHF Repeater Station (4ch)
DS-15	Rack Arrangement for Fixed UHF Repeater Station (7ch)
DS-16	Outside View of Battery Rack
DS-17	Block Diagram of Power Supply System for National Command Station [1.3(1)]
DS-18	Block Diagram of UHF Base Radio for Parish Control Station
DS-19	Block Diagram of Power Supply System for Portable Radio Station for Community [1.3(3)]
DS-20	Appearance of Case for Portable Radio Station for Community
DS-21	Network Diagram of VHF-AM Ground to Air Radio / Marine Radio Interface
ES-01	Block Diagram of Early Warning System (EWANS)
ES-02	Block Diagram of Power Supply for Siren System
A-01	New Repeater Station Hut Plan (Standard type)
A-02	New Repeater Station Hut Plan (Compact type)

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

The Project will be implemented based on the Government of Japan's Grant Aid scheme. Therefore, it will be implemented after approval is granted by the Government of Japan and the Exchange of Notes (E/N) and the Grant Agreement (G/A) are signed by the Government of Japan and the Government of Jamaica. The following paragraphs describe the basic items and points that require particular consideration when implementing the Project.

(1) Project Implementing Agency

The Project implementing agency on the Jamaican side is ODPEM, while the Ministry of Local Government and Community Development (MLGCD) is the Project responsible agency. The implementing department in ODPEM is the Preparedness and Emergency Operations Division (PEOD), which will execute the Project and also be in charge of equipment operation and maintenance. Therefore, in order to smoothly advance the Project, it will be necessary for the ODPEM Preparedness and Emergency Operations Division to conduct close liaison and discussions with the Japanese consultant and Japanese supplier and appoint personnel in charge of the Project.

(2) Consultant

In order to implement the procurement and installation of equipment in the Project, the Japanese consultant will conclude a design supervision contract with ODPEM and implement the implementation design and execution supervision. Also, the consultant will prepare tender documents and conduct the tender on behalf of ODPEM (the Project implementing agency).

(3) Japanese supplier

In accordance with the framework of the Government of Japan's Grant Aid scheme, the Japanese supplier that has been selected by the Jamaican side in competitive tender will implement the equipment procurement, installation works, and initial guidance and operating guidance of the Project. Since it will be necessary to continue supplying spare parts and conducting post-installation service to resolve breakdowns and so on after the completion of the Project, it will be necessary for the Japanese supplier to establish a liaison setup with ODPEM after the handover of the equipment.

(4) Necessity for Dispatch of Engineers

The equipment to be procured in the Project comprises IT instruments for using in radio repeater stations, public agencies, etc., and it will be inspected in Japan before shipping to Jamaica. Therefore, because high-level technology will be needed to install the Project equipment and conduct post-installation testing, adjustment, etc., it will be necessary to

dispatch engineers from Japan to carry out quality control, technical guidance and schedule control activities.

2-2-4-2 Implementation Conditions

It is possible to secure laborers for construction works in Jamaica; however, there are few skilled workers or engineers specialized in schedule, quality, safety, etc. control technologies. Therefore, it will be necessary for the Japanese supplier to dispatch skilled workers and engineers from Japan to Jamaica as the need arises. As for the construction machines required for the inland transportation and installation of the Project equipment, the aggregate, etc. required for the concrete works and so on, such items can be procured in Jamaica.

2-2-4-3 Scope of Works

The Japanese side will be responsible for construction of the radio repeater station huts and procurement and installation of radio equipment, while the Jamaican side will be responsible for repairing existing radio repeater station huts, removing existing equipment and securing power lines and so on. Table 2-2-10 shows the scope of works on the Japanese and the Jamaican sides.

Table 2-2-10 The Work and Cost Demarcation of the Project

No.	Undertakings	To be covered by		Notes
		Japan	Jamaica	
A	**Common to All Components**			
1	To open Bank Account (Banking Arrangement (B/A))		●	To complete within 1 month after G/A
2	Bearing of the following commissions paid to the Japanese bank for banking services based upon the Banking Arrangement (B/A)			
	(1) Advising commission of Authorization to Pay (A/P)		●	
	(2) Payment commission		●	
3	Securing of lands for installation of equipment (hereinafter referred to as "the Project sites"), bush clearing and removal of obstacles in the Project sites		●	To complete before the Tender Notice.
4	Construction of Access road to the Project sites, if necessary		●	
5	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●	
6	Assuring security for personnel in the Project sites, when necessary		●	
7	To submit Project Monitoring Report		●	
8	Procurement of the Equipment	●		"The Equipment" is defined as the equipment and materials to be provided by the Japanese side under the Project.

No.	Undertakings	To be covered by		Notes
		Japan	Jamaica	
9	To secure the following storages, facilities, sites, yard, etc.; (1) Storages for the Equipment in Kingston and Montego Bay (2) Temporary offices for the Consultant and the Supplier (3) Sites for material storing yard (4) Temporary construction yard (5) Waste disposal around the Project sites		●	
10	To ensure that custom duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the Products and/or the Services be exempted, such as, (1) Import Duties, (2) Customs administration Fee (CAF), (3) General Consumption Tax, (4) Withholding Tax on Special Services (5) Contractors Levy (6) Environmental Levy (7) Standard Compliance Fee		●	
11	Transportation of the Equipment, customs procedures and tax procedures			
	(1) Marine/air transportation to a port of disembarkation in Kingston	●		
	(2) Procedures for tax exemption and customs clearance at the port of disembarkation		●	
	(3) Secure the storage for the Equipment in Kingston and Montego Bay		●	Confirm an availability to use as a workshop for the installation of Mobile Radio Station
	(4) Internal transportation from the port of disembarkation to the storage of Kingston and Montego Bay	●		
	(5) Internal transportation from the storage of Kingston and Montego Bay to the Project sites	●	●(#)	#Refer to B7 (5) and B8 for detail.
12	Provision of general furniture for the Equipment		●	1 locker at St. Anns Bay Hospital
13	To obtain the confirmation letter for (1) Permission of the Installation Work at the Project sites (2) Permission to enter the Project sites		●	
14	Ensuring the required power supply			
	(1) For the equipment to be installed in the existing building		●	
	(2) For Repeater Sites		●	To connect commercial power to the primary-side of the Power Distribution Panel.
15	Establish of Maintenance Center		●	
16	Installation of security fences and gates in and around the Project sites and Guardhouse, if necessary		●	
17	Installation of the Equipment, Adjustment and Testing	●		
18	Providing of security to the Equipment			
	(1) During the implementation of the Installation Work	●		
	(2) After the handing over of the Equipment		●	
19	Provision of trainings for Initial operation and maintenance of the Equipment			
	(1) To the staff of ODPEM and the related agencies	●		See Table 2-2-12
	(2) To the staff of the public organizations (Police Station, Fire Brigade Station, Hospital, Ministry of Local Government Agencies, etc.) who will use the Equipment		●	

No.	Undertakings	To be covered by		Notes
		Japan	Jamaica	
20	Bearing of all the expenses, other than those covered by the Grant and its accrued interest, necessary for the implementation of the Project		●	
21	Allocation of necessary staff and budget for the operation and maintenance of the Equipment, including the periodical maintenance work after the completion of the Project		●	
22	Proper operation and maintenance of the Equipment		●	
23	Proper disposing of spent batteries		●	
B	**Disaster-Emergency Communication System (DECOM)**			
1	Obtaining of the confirmation letter for:			
	(1) Acquiring permission to use lands and antenna towers for Radio Repeater Stations		●	The Hut in Planters Hall will be only required a rent payment.
	(2) Acquiring permission for installation of HF-SSB, VHF Base Station, UHF Base Station and Power Supply System at NEOC, PEOC and Community.		●	
	(3) Acquiring permission for installation of Mobile Radio Station on vehicles of the public organizations (Police Station, Fire Brigade Station, Hospital and Ministry of Local Government Agencies)		●	
	(4) New frequencies for the Microwave Link and new UHF frequencies for the Radio Repeater Stations including necessary arrangement for allocation of those frequencies.		●	
2	Securing the capacity of NWA's IP Core Backbone Network for DECOM		●	
3	To construction Hut or Outdoor rack in the Project site of Repeater Sites as follows; 1) New Concrete Hut (6 locations) 2) Outdoor Rack with Solar System (1 location)	●		
4	Rehabilitating the existing Repeater Station Huts		●	
5	Removing/Clearing the existing equipment/facilities in the existing repeater stations		●	
6	Ensuring of connection between NWA's IP Core Backbone Network and DECOM		●	
7	Installation of the Mobile Radio Station to the vehicles of the public organizations			
	(1) Secure the workshop in Kingston and Montego Bay for the installation of the Mobile Radio Station to the vehicles of the public organizations		●	
	(2) Transportation of the Mobile Radio Station from the storage of Kingston and Montego Bay to the workshop if necessary	●		
	(3) Transportation of the vehicles to the workshop		●	
	(4) Installation of the Mobile Radio Station to the vehicles	●		
	(5) Distribution of the vehicles installed Mobile Radio Station to the public organizations		●	
8	Distribution of the Handheld Radio Set, Community Operation Station, Operation Station for Cay and Communication Support Equipment to each location		●	That equipment will be handed over to ODPEM at the storage of Kingston and Montego Bay.
9	Periodical cleaning of the Equipment and the Project sites		●	Especially Solar panel should be cleaned every month.
10	Proper operation and management of the Handheld Radio Set to be used at each location			
	(1)Periodical inventory check by ODPEM		●	

No.	Undertakings	To be covered by		Notes
		Japan	Jamaica	
	(2)Periodical report about result of inventory check		●	Twice a year to JICA Jamaica office
C	**Early Warning System (EWANS)**			
	Securing of lands for installation of the siren tower, bush clearing and removal of obstacles in the Project sites		●	To complete before the implementation of the Project.

Remark: ● denote the side responsible for the work

2-2-4-4 Consultant Supervision

(1) Basic Policy of Consultant Supervision

The consultant has the obligation to organize a project team in charge of the Project affairs and to smoothly execute the detail design and the supervision work in accordance with the contents of the Guideline of Japan's Grant Aid and the outline design. The consultant will dispatch specialist engineers according to the progress of the equipment installation works, onsite test and adjustment works, etc., and it will guide and supervise the Japanese supplier and strive to control the schedule, quality, progress and safety based on the plan. Also, they have the obligation to implement pre-shipping inspections of the equipment and prevent any troubles from arising after the equipment has been transported.

The major points to bear in mind regarding the consultant supervision are described below.

1) Schedule Control

The consultant will compare the progress of the work with the implementation schedule decided by the Japanese supplier in the contract every month or every week in order to adhere to the delivery deadline given in the contract. In cases where delays are predicted, the procurement agent will warn the Japanese supplier and demand the submission and implementation of a plan of countermeasures. Comparison of the planned schedule and actual progress will mainly be based on the following items:

a) Confirmation of works performance (plant manufacture and shipping performance)

b) Confirmation of equipment delivery

c) Confirmation of schedule according to the implementation schedule

2) Quality Control

Quality control will be carried out based on the following items to determine whether the procured equipment satisfies the required quality stated in the contract documents. In cases where doubts arise over quality as a result of conducting confirmation and checks, the consultant will immediately demand the Japanese supplier to make amendments, revisions or corrections.

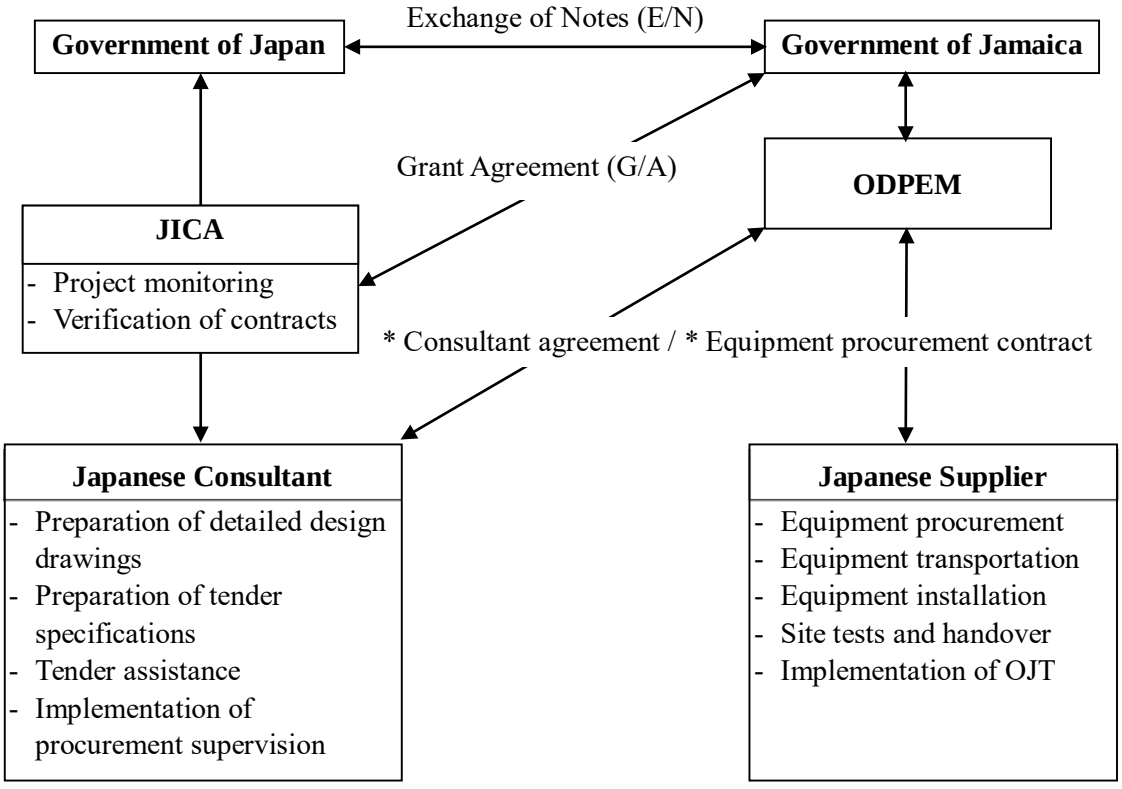
① Checking of equipment specifications
② Checking of shop drawings and specifications of equipment
③ Attendance of plant inspections of equipment and checking of plant inspection results
④ Checking of installation guidelines
⑤ Checking of trial operation, adjustment, test and inspection guidelines of equipment
⑥ Supervision of equipment installation works and witnessing of trial operation, adjustment and testing

3) Labor Supervision

Discussions will be held and cooperation will be sought with responsible officers of the Japanese supplier, and safety control will be exercised during the construction period in order to prevent the occurrence of industrial accidents on the Project site, injuries to third parties or any other accidents. Important points to consider in safety control on the ground are as follows:

① Establishment of safety control regulations and appointment of manager
② Planning of the work vehicles and construction machinery operating routes and thorough enforcement of safe driving
③ Encouragement of laborers to utilize welfare measures and vacations
④ Security measures during the stay

Figure 2-2-6 shows the relationships between the parties involved in the Project



*Note: The Consultant agreement and the equipment procurement contract require verification by JICA

Figure 2-2-6 Project Implementation Relationships

(2) Works Supervisor

The Japanese supplier will procure and deliver equipment and implement the installation works. Since the Japanese supplier will need to thoroughly ensure that the subcontractor complies with the works schedule, quality, progress and safety measures prescribed in the contract, it will dispatch engineers who have experience of similar projects in overseas countries to provide guidance and education on the ground.

2-2-4-5 Quality Control Plan

Pre-shipping inspections will be encouraged to make sure that the procured equipment complies with the technical specifications indicated in the tender documents. Moreover, during installation, quality control works will be carried out according to the execution control criteria indicated in the execution guidelines.

2-2-4-6 Procurement Plan

The equipment to be procured for the Project will basically be procured from Japan, however, some items that are not handled by Japanese manufacturers will be procured in Jamaica or from third countries.

Concerning the NWA network connection system for connecting to the NWA trunk IP microwave lines, since it will be necessary to align with the existing NWA equipment composition, it has been decided to locally procure the equipment that is designated by NWA. Table 2-2-11 shows the procurement sources.

Table 2-2-11 Equipment Procurement Sources

No.	Item	Country of Origin		
		Japan	Jamaica	Third Countries
1	**Disaster-Emergency Communication System (DECOM)**			
1.1	Radio Repeater Station			
(1)	Fixed UHF Repeater Station (4ch)	○	―	―
(2)	Fixed UHF Repeater Station (7ch)	○	―	―
(3)	Transportable UHF Repeater Station	○	―	―
(4)	Microwave Link			
1)	Long Range	○	―	○ (USA)
2)	Short Range	○	―	○ (USA)
3)	Long Range with Diversity	○	―	○ (USA)
4)	Short Range (Transportable Type)	○	―	○ (USA)
(5)	Power Supply System			
1)	For Fixed UHF Repeater Station (4ch)	○	―	―
2)	For Fixed UHF Repeater Station (4ch) with Large Capacity	○	―	―
3)	For Fixed UHF Repeater Station (4ch) with Solar backup	○	―	―
4)	For Fixed UHF Repeater Station (7ch)	○	―	―
5)	For Transportable UHF Repeater Station	○	―	―
6)	DC-DC Converter for Microwave Link	○	―	―
7)	AC/DC48V Power Supply Unit for Microwave Link	○	―	―
8)	AC/DC48V Power Supply Unit for Microwave Link with UPS	○	―	―
(6)	Radio Management System	○	―	―

No.	Item	Country of Origin		
		Japan	Jamaica	Third Countries
(7)	GPS Location Management System	―	―	○ (Canada/NZ)
(8)	NWA Network Connection System	―	―	○ (China) *Procured in Jamaica
(9)	Equipment Rack			
1)	19in Rack	○	―	―
2)	19in Rack (Space-Saving Type)	○	―	―
3)	Battery Rack	○	―	―
4)	Outdoor Rack	○	―	―
1.2	Two-Way Radio Terminal			
(1)	Base Radio	○	―	○ (NZ)
(2)	Base Radio (Marine Type, DC24V)	○	―	○ (NZ)
(3)	Mobile Radio			
1)	For Fire Engine	○	―	○ (NZ)
2)	For Passenger Vehicle (Magnet Mount Antenna Type)	○	―	○ (NZ)
3)	For Passenger Vehicle (Window Mount Antenna Type)	○	―	○ (NZ)
(4)	Handheld Radio			
1)	Handheld Radio (Standard Set)	○	―	○ (NZ)
2)	Handheld Radio (Mobile Radio Set)	○	―	○ (NZ)
3)	Handheld Radio (IS Type)	○	―	○ (NZ)
1.3	Integrated Command and Control Station			
(1)	National Command Station			
1)	HF-SSB (type A)	○	―	○ (Australia)
2)	VHF Base Radio (type A)	○	―	○ (NZ)
3)	UHF Base Radio (type A)	○	―	○ (NZ)
4)	Power Supply System (type A)	○	―	―
(2)	Parish Control Station			
1)	HF-SSB (type B)	○	―	○ (Australia)
2)	UHF Base Radio (type B)	○	―	○ (NZ)
3)	Power Supply System (type B)	○	―	―
(3)	Portable Radio Station for Community			
1)	HF-SSB (type C)	○	―	○ (Australia)
2)	VHF Base Radio (type C)	○	―	○ (NZ)
3)	UHF Base Radio (type C)	○	―	○ (NZ)
4)	Power Supply System (type C)	○	―	―
5)	Handheld Radio (type C)	○	―	○ (NZ)
(4)	Operation Station for Cay			
1)	HF-SSB (type D)	○	―	○ (Australia)
2)	VHF Base Radio (type D)	○	―	○ (NZ)
3)	UHF Base Radio (type D)	○	―	○ (NZ)
4)	Power Supply System (type D)	○	―	―
5)	Handheld Radio (type D)	○	―	○ (NZ)
1.4	Communication Support Equipment			
(1)	VHF-AM Ground to Air Radio Repeater	○	―	○ (Australia/USA)
(2)	VHF-FM Marine Radio Remote Interface	○	―	○ (Australia/USA)
(3)	Ground to Air/Marine Radio Terminal	○	―	○ (Australia/USA)
(4)	Ground to Air Radio	○	―	―
(5)	Marine Radio	○	―	―
2	**Early Warning System (EWANS)**			
2.1	Siren System	○	―	―
2.2	Siren Tower	○	―	―
2.3	Siren Mast	○	―	―
3	**Maintenance Equipment and Tools**			
3.1	Workshop Maintenance Tools	○	―	―

No.	Item	Country of Origin		
		Japan	Jamaica	Third Countries
3.2	Field Maintenance Tools	○	―	
3.3	Radio Monitor (Portable)	○	―	―
3.4	SWR Power Meter (HF)	―	―	○ (USA)
3.5	SWR Power Meter (VHF/UHF)	―	―	○ (USA)
3.6	Measuring Kit	○	―	―
4	**Spare Parts** (UHF Repeater Main Unit, UHF Repeater Power Unit, UHF Repeater Control Unit, AC/DC Power Supply, Layer3 Switch, Antenna for Two-way Radio Terminal, etc.)	○	―	

2-2-4-7 Operational Guidance Plan

Three employees who belong to the ODPEM Preparedness and Emergency Operations Division (PEOD) are in charge of maintaining radio communications equipment, and there are no problems regarding the operation and maintenance of existing analog radio equipment. However, because the equipment to be procured in the Project will be state-of-the-art professional digital radio communications equipment not on general sale, it will need to undergo design, manufacture and testing in a single lot at the Japanese plant. Accordingly, it will be necessary for the engineers dispatched by the Japanese supplier to conduct technical guidance using the actual equipment for the engineers on the Jamaican side. Table 2-2-12 shows the items, contents and targets (trainees) of the technical guidance.

Table 2-2-12 Technical Guidance Items

OJT	Name of Training	Contents	Period	Trainer from the Supplier	Trainee
Initial Operation Training	System Management Training	・ Whole DECOM system management by Classroom training	1 week (during the installation)	1	3 (2 x ODPEM, 1 x NWA)
	Basic Radio Training	・ Initial operation of radio terminals	2 days (after the installation)	1	Max. 20 for ODPEM Special Training Team
Total System Training	System Management Training	・ On-site training by using the Equipment under operation. ・ Troubleshooting ・ Repeater programming for future expansion/modification	1 week (after the installation)	1	3 (2 x ODPEM, 1 x NWA)
	Field Engineers Training	Maintenance and troubleshooting on: ・ Repeater ・ Power Supply ・ Microwave Link ・ Antenna System ・ Safety procedures	10 days (after the installation)	1	18 (2 x ODPEM, 4 each from JFB, JPS, JCF, AEROTEL)

2-2-4-8 Implementation Schedule

The Project implementation schedule has been compiled as shown below based on the Government of Japan's Grant Aid guidelines. Including the implementation design, the

equipment procurement and installation works, the Project will take approximately 22.5 months.

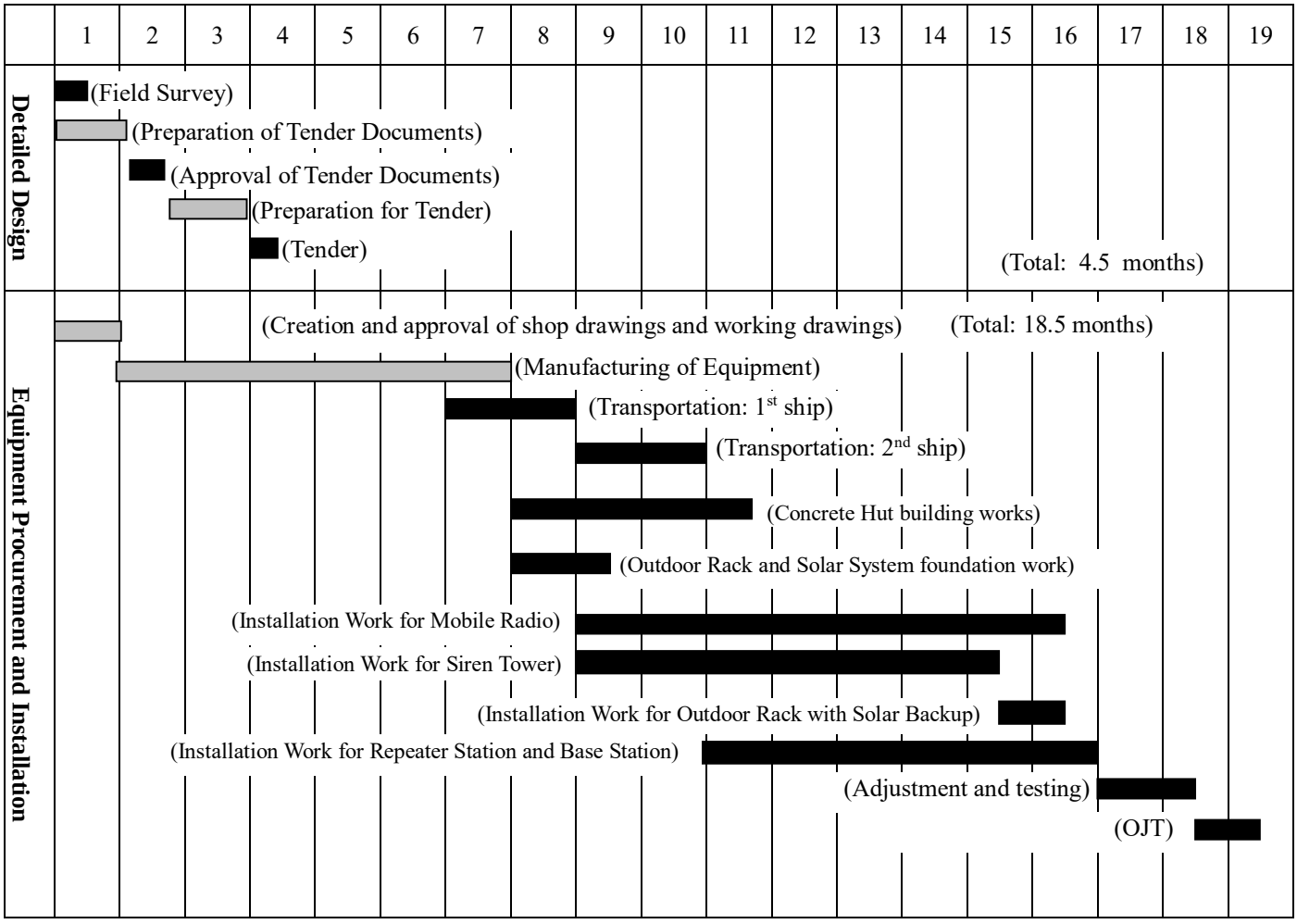
Due to differences in the equipment manufacturing lead-times, the equipment will be transported in two shipments as follows. Accordingly, the plant on-the-spot inspections and pre-shipping inspections will be implemented two times each.

First shipment: Mobile radios and siren tower

Second shipment: Radio equipment (radio repeaters, fixed radios, handheld radios, communication support equipment, siren system, siren mast, maintenance measurement devices and tools, spare parts, etc.), and outdoor racks

Table2-2-13 shows the Project implementation schedule.

Table 2-2-13 Project Implementation Schedule



Source: JICA Project Team

2-3 Obligations of Recipient Country

The Japanese side will be responsible for the procurement and installation of equipment and construction of the radio repeater station huts in the project, while the Jamaican side will be responsible for removing existing equipment, removing or repairing existing and huts, etc. The detailed scope of works on the Jamaican side is described below.

(1) Securing, Leveling, Grass Cutting and Removal of Obstructions in the Project sites

The Jamaican side will secure equipment installation space on each site. Particularly concerning the candidate sites for radio repeater stations, it is expected that the landowners will freely give permission to install equipment inside existing huts and lease land for the construction of new huts. However, concerning Planters Hall Station, since it has been confirmed that costs will arise in order to install and use equipment inside the existing hut, it will be necessary to include these in the operation and maintenance budget on the Jamaican side.

(2) Securing of Commercial Power Supply

The Jamaican side will secure power sources for the equipment to be installed at each Project site. At the radio repeater station candidate sites, power supply can be secured for free by branching from the breaker panel inside the existing huts, however, at Sliogoville Station, since such branching cannot be performed due to circumstances of the landowner, it will be necessary to extend a power cable and commercial wattmeter, etc. from the JPS distribution transformer to the distribution panel in the new hut, and to include this in the cost burden on the Jamaican side.

(3) Establishment of Maintenance Centers

The Jamaican side plans to establish two maintenance centers under the initiative of ODPEM and JFB, and this will bolster the operation and maintenance setup for the Project equipment.

(4) Securing of Equipment Warehouses and Temporary Offices

The Jamaican side will secure storage for the Equipment and temporary offices for the operators and consultants through utilizing the two existing warehouses in Kingston (ODPEM) and Montego Bay (Montpelier).

(5) Tax Exemption Measures

Table 2-3-1 shows the customs duties, internal taxes and other fiscal levies, that are relevant to the Equipment that will be procured in Jamaica in the Project. Tax exemption measure in the Project is not taken by refund system of the tax. Executing agency and/or Japanese supplier will be exempted from the payment of the above customs duties, internal taxes and other fiscal levies.

Table 2-3-1 Taxes and Levies on Project Equipment

Type of Taxes and Levies	Taxes and Levies related with the Project		Remarks
Custom Duties	①	Import Duty	Imposed on import products from overseas. An amount of Import duty depends on a value added of the product.
	②	Custom Administration Fee	The CAF consists of two (2) parts: The Examination Fee (eCAF) and The Processing Fee (pCAF) 1.The Examination Fee (eCAF) The eCAF amount payable is base on the size and/or type of package being imported. If your package is a 'Barrel, Small Carton, or other Small Personal Shipments' then no eCAF is applicable. However, if your shipment is a 'Pallet, Skid, D or E Container (i.e. very large box)' then your eCAF will be J$2500. Containers (20′,40′, etc) attract an eCAF of Between J$20,000 – J$25,000. 2.The Processing Fee (pCAF) The pCAF amount payable varies based on the type(s) of document being used to process the shipment. This ranges from between J$1500 – J$2,500 for personal shipments and $55,000 for motor vehicles. Comercial shipments will attract a pCAF of between J$5,000 – J$25,000
Internal Taxes	③	General Consumption Tax (GCT)	The GCT is a value added tax which is applied on the value added to goods and services at each stage in the production and distribution chain. It is a tax on consumption and is included in the final price the consumer pays for goods and services. Most goods and services are taxed at sixteen and one-half percent (16.5%)
	④	Withholding Tax on Special Services	Specified large taxpayers are required to withhold tax at 3% on fees of $50,000 or more paid to a variety of service providers including accountants, lawyers, engineers, caterers, entertainers, janitors, as well as those providing rental of motor vehicles/equipment and those providing transportation, haulage or tours. (Local Consultant and Subcontractor as well) If a client is foreign company, an employee pays the tax. (It won't be imposed the tax, in case the contract price is less than 50,000JMD)
Other Fiscal Levies	⑤	Contractors Levy	The Construction Industry and Tillage industries are subject to a levy of 2% of contract price payable to the Commissioner of Inland Revenue.
	⑥	Environmental Levy	Applicable to all items that will have an impact on the environment Rate: 0.5% Calculated on CIF Value
	⑦	Standards Compliance Fee	Collected by Customs on Behalf of the Bureau of Standards Applicable to all Goods that require quality control or regulation of standards Rate: 0.3 % Calculated on CIF Value

Source: JICA Project Team

Appendix 9 shows the procedures required for the exemption the taxes and levies indicated above.

(6) Temporary Storage Areas

The Jamaican side will provide locations close to the Project sites where the equipment and materials procured in the Project can be temporarily stored with protection against theft until the end of the installation works.

(7) Securing of Waste Dump

The Jamaican side will secure a site to dispose of the materials generated in removal of obstructions from the new radio repeater station sites before construction of the hut construction works.

(8) Installation of Fences and Gates

The Jamaican side will install fences and gates around the Project sites.

(9) Supply of Furniture

The Jamaican side will provide the furniture (desks, lockers, etc.) that is needed for the equipment installation.

(10) Initial Guidance and Operating Guidance of Procured Equipment

Following the initial guidance and operating guidance implemented by the Japanese supplier, engineers appointed by the Jamaican side will conduct similar guidance for the employees of related agencies that operate the supplied equipment.

(11) Disposal of Batteries

The Jamaican side will appropriately dispose of the waste batteries that arise due to operation of the Project equipment.

(12) Securing of Personnel and Budget

The Jamaican side will secure the necessary personnel and budget for operating and maintaining the Project equipment. As shown in Figure 2-3-1, ODPEM will manage, operate and maintain the Project equipment by a management structure with additional one radio engineer. Then ODPEM will include personnel expenses (JMD5,000,000/year) for employing the additional radio engineer in future budget plans. In case that ODPEM needs more staffs by reviewing the Project structure for operation, management and maintenance, ODPEM will revise the budget plan to include those additional expenses.

The radio engineer is required to have the following experience, qualification, etc. mainly.

- Degree or Diploma in Telecommunication/Electric Engineering or equivalent
- Radio communication or electric appliance for at least 3 years
- Good knowledge of HF/VHF/UHF/SHF radio system and its propagation.
- Radio license

- Good skill of tower climbing.

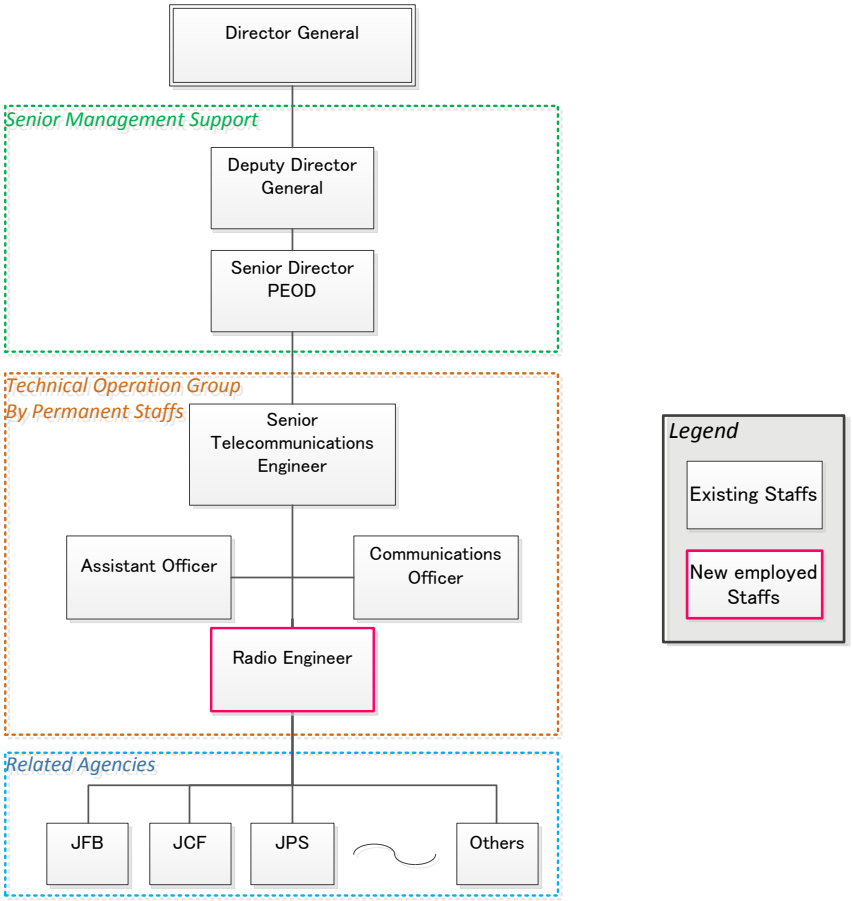


Figure 2-3-1 Management Structure of ODPEM for the Project

(13) Connection of the NWA Trunk IP Microwave Lines and DECOM

After the Japanese supplier has installed the DECOM equipment in the NWA repeater stations, the engineers on the Jamaican side will conduct the port settings for the NWA network connecting system on the DECOM side and connect the system with the NWA trunk IP microwave lines.

(14) Repair of Existing Radio Repeater Station Huts

The Jamaican side will conduct repair of the existing repeater stations by the start of the radio repeater installation works by the Japanese supplier.

(15) Allocation of Vehicles to be fitted with Mobile Radios to Workshops

In line with the installation schedule regarding mobile radios provided by the Japanese supplier, ODPEM will coordinate the schedule with each related agency that owns the vehicles to be installed with radios and arrange for the vehicles to be sent to the OPDEM warehouses in Kingston or Montego Bay.

(16) Delivery of Handheld Radios, etc.

Upon receiving the following equipment from the Japanese supplier at the warehouse, ODPEM will deliver it to each related agency:

① Handheld radios

② Community radio base stations

③ Communication support equipment

2-4 Project Operation Plan

2-4-1 Structure for Management, Operation and Maintenance

Management, operation and maintenance for the Project will be implemented with the management structure as shown in Figure 2-3-7, the additional one radio engineer to be employed will coordinate with the related organizations of JFB, JCF, JPS, etc. under the senior telecommunications engineer, support smooth implementation of the Installation Work and OJT (Initial Operation Training and Total System Training) by the Supplier and will be continuously in charge for maintenance works including periodical inspections and repair works after the handing over of the Project equipment to the Jamaican side.

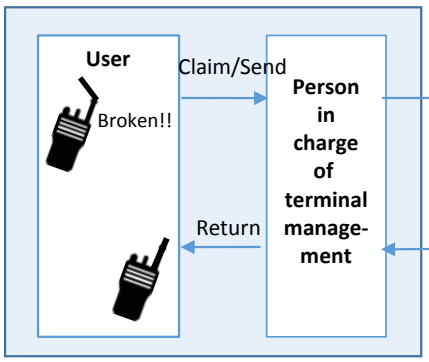
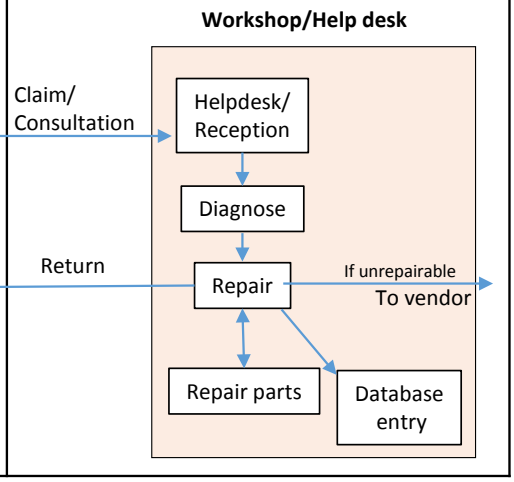
Table 2-4-1 shows the major tasks of operation and maintenance works of the Project equipment by ODPEM. Though ODPEM will mainly implement management, operation and maintenance of the equipment, the related agencies will cooperate with ODPEM and undertake those works periodically.

Table 2-4-1 Major Tasks of Operation and Maintenance Works by ODPEM

No.	Contents
1	Central communication control of DECOM
2	Remote monitoring and control of radio repeater stations
3	On-site maintenance at radio repeater stations (e.g. Check RF status, replacing broken unit)
4	On-site electric power back-up at repeater stations when black-out (e.g. Carrying transportable generator to the site)
5	Deployment of transportable repeater stations in emergency
6	Annual on-site health-check at radio repeater stations
7	Help desk operation to radio terminal users
8	Workshop operation (Repairing of damaged radio terminals, e.g. replacing antenna of radio terminals)
9	Management of re-allocation of radio terminals and re-programming terminals
10	Management of radio terminal database
11	Planning of deployment and drills of periodical operation of portable radio station for community

Table 2-4-2 shows the role and work flow for management of radio terminals by ODPEM and the related agencies. ODPEM and the related agencies will make a memorandum of understanding (MOU) for realizing responsibility of the management of radio terminals prior to the distribution from ODPEM to the related agencies. Each agency is required to assign a person in charge of radio terminal management for the smooth communication with ODPEM in trouble.

Table 2-4-2 Role and Work Flow for Management of Radio Terminals by ODPEM and Related Agencies

	Related Agencies (Users)	MOU	ODPEM (Workshop)
Role and Responsibility	• Appropriate management and use of radio terminal allocated • Claim to ODPEM (Workshop) when trouble happen • Send broken terminal to Workshop • Send terminal to Workshop when reprogram is needed • Return terminal to Workshop when no longer needed • Periodical inventory check and report to ODPEM		• Total coordination of terminal allocation to each agency • User consultation at Workshop/Help desk • Diagnose/repair/return of claimed terminal • Management of common pool or returned terminal from users • Programming of terminals • Supplementation of repair parts • Update of terminal management database • Management of inventory check and report
Work flow (Sample in case of terminal failure)			

Source: JICA Project Team

2-4-2 Operation and Maintenance Plan

Periodic upgrading will be taken into consideration when planning maintenance of the Project equipment. Table 2-4-3 shows the equipment maintenance plan. In order to appropriately operate the DECOM digital radio network and radio terminal equipment, it will be necessary to procure and upgrade the equipment based on the planned ODPEM budget. The batteries used in handheld radios and radio stations are constantly used and will need to be regularly changed once every 5~10 years. The antennas, micro link outdoor units, indoor units, etc. will need to be replaced appropriately when they wear out or break down. The depreciation period

of radio communications equipment is 7~10 years, however, since the Project radios are professional products with high durability, it is planned to upgrade the radio equipment 10 years after the start of operation.

Table 2-4-3 Equipment Maintenance Plan

Replacement Timing	Spare Parts
When it consumes/ breaks	Antenna, IDU and ODU of Microwave Link, Repeater Module, Power Supply System, Surge Absorber and Lightning Resistant Transformer
Every 5years (Charge and Discharge battery a week)	Battery for Handheld Radio
Every 10 years	Battery for Fixed UHF Repeater Station (DC2V) Battery for Integrated Command and Control Station (DC12V) Fixed UHF Repeater Station, Microwave Link System, UHF Base Radio, Siren System and etc.

Source: JICA Project Team

2-4-3 Regular Inspection Items

Due to the technological innovations of recent years, electronic instruments have acquired greater reliability and durability; moreover, equipment troubles have become less frequent because fewer components are used. In view of this trend, maintenance inspection cycles for equipment are becoming longer in Japan. However, in order to effectively utilize equipment over a long period, it is important to implement routine and periodic inspections without fail. Therefore, it will be necessary to prepare the minimum necessary maintenance standards for routine and periodic inspections and prepare a setup for preventing equipment failures in advance. Table 2-4-4 shows the routine and periodic inspection items and necessary inspection instruments for the equipment to be procured in the Project.

Among the radio terminals, concerning the handheld radios (845 units), since users in each disaster prevention agency will use them outdoors, it will be necessary to periodically confirm quantities and manage the equipment. ODPEM will sign an MOU with each disaster prevention agency and conduct management entailing: ① periodic implementation of stock checks of handheld radios, and ② implementation of reception checks using the radio management system. The checks described in ① and ② will be implemented under the initiative of the local implementing agency, i.e. ODPEM; hence it is recommended that the JICA Jamaica office conducts periodic confirmation at ODPEM around once every six months.

Table 2-4-4 Equipment Inspection Items

Type of Inspection	Inspection item	Subject	Required Tools and the Equipment
Daily inspection /Inspection before operation	Inspection items by Remote Monitoring - Transmission Output (Each Channel) - VSWR (Antenna for Transmission) - Battery Voltage	Radio Repeater Station	Radio Management System
	Inspection for checking proper function by Remote Monitoring	Radio Terminal	
	Visual Check for Connection part of antenna	Radio Terminal (Base Radio and Mobile Radio) Integrated Command Station	-
	Roll Call	Radio Terminal Integrated Command Station	-
Annual inspection (Characteristic Test)	Visual Check for Connection part of antenna	Radio Repeater Station	-
	Voltage Measurement for each part	Radio Repeater Station Integrated Command Station	Tester
	Measurement of VSWR for antenna	Radio Repeater Station	SWR Power Meter
	Measurement of Transmission Output power for Fixed UHF Repeater Station	Radio Repeater Station	Radio Monitor
	Visual Check of LED display of Fixed UHF Repeater Station	Radio Repeater Station	-
	Check for function of Air Conditioning	Radio Repeater Station	-

Source: JICA Project Team

2-4-4 Spare Parts

Table 2-4-5 shows the spare parts that ODPEM will need to procure in the 10 years following the Project implementation. Since these products will be used outdoors and installed to vehicles, meaning that they will be exposed to risk of breakage due to hurricanes, poor weather, etc., it is expected they will be replaced around once every 10 years. The Jamaican side will need to budget for the purchase of spare parts that will become necessary one year or more after the completion of the Project. In order to continue implementing appropriate maintenance, ODPEM will need to secure the costs for replacing spare parts every year.

Table 2-4-5 Spare Parts

Item	Subject	Quantities for 10years	Quantities for 1 year
Antenna System for Fixed UHF Repeater Station	Repeater Sites 24 locations Transportable UHF Repeater Station 1set 2 sets each for above 25 locations (1 set for Transmission, 1 set for Receiving)	50 sets	5 sets
Antenna System for Two way Radio Terminal	Base Radio 107 sets Base Radio (Marine-type) 2 sets HF-SSB 21sets VHF Base Radio 7 sets UHF Base Radio 21 sets *including 2 spare antenna system for Base Radio (Marine-type)	160 sets	16 sets
Antenna for Mobile Radio	Mobile Radio 302 sets *including 8 spare antennas	310 pcs	31 pcs
Antenna for Handheld Radio	Handheld Radio 845 sets *including 155 spare batteries	1,000 pcs	100 pcs

Source: JICA Project Team

2-4-5 Consumable Parts

Table 2-4-6 shows the consumable parts that will need to be procured by ODPEM over five years after the Project. These products will be used frequently and it is expected will have a shorter service life than the spare parts described earlier. Concerning the handling of spare parts and consumable parts, it is scheduled for Japanese engineers to conduct technology transfer to ODPEM employees or relevant station engineers via the initial guidance and operating guidance during the site works, and ODPEM will need to secure the funds to purchase consumable parts every year to make sure the continuation of appropriate maintenance.

Table 2-4-6 Consumable Parts

Item	Quantities for Every 5 years	Quantities for 1 year
Battery for Handheld Radio	1,000 pcs (including 155 pcs as spare)	200 pcs

Source: JICA Project Team

2-4-6 Future Plan

In addition to ODPEM, the **Jamaica Constabulary Force** (JCF), Jamaica Fire Brigade and other public agencies will use the DECOM digital radio network and radio terminal equipment supplied in the Project. Accordingly, ODPEM is compiling a joint operation plan with the agencies that utilize DECOM, and it has requested each agency to cooperate with maintenance, so it is expected that the load placed on ODPEM will be mitigated.

Currently, the communications officials of ODPEM and JFB are assigned in the east and west of the country, and it is expected that maintenance centers will be established to conduct

periodic patrol inspections of the radio repeater stations, on-site repairs in cases of breakdowns and other rapid response activities.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) Cost Estimation Borne by the Government of Japan

This section is closed due to confidentiality.

(2) Cost Estimation Borne by the Government of Jamaica

No.	Item	Estimated Cost (JMD)	Remarks
1	Securing of lands for installation of equipment (hereinafter referred to as "the Project sites"), bush clearing and removal of obstacles in the Project sites	25,000	Rent payment/year for Hut in Planters Hall
2	Ensuring the required power supply for the new Repeater Station Hut in Sliogoville	421,000	Initial Cost to install power meter: Cable x 1 lot, Breaker x 4, Earth rod x 1, Light pole x 1 and installation fee, Power Meter x 1
3	Rehabilitating the existing Repeater Station Huts	2,625,000	21,600USD for 14 Repeater Station Huts
4	Removing/Shifting the existing equipment/facilities in the existing repeater stations	300,000	Removing existing equipment and hut 20,000JMD x 15 repeater stations
5	Provision of general furniture for the Equipment	19,000	1 locker x 19,000JMD at St. Anns Bay Hospital
6	Allocation of necessary staff and budget for the operation and maintenance of the Equipment, including the periodical maintenance work after the completion of the Project	5,000,000	1 Staff x 5,000,000 JMD
7	Bearing of the following commissions paid to the Japanese bank for banking services based upon the Banking Arrangement (B/A)		
	(1) Advising commission of Authorization to Pay (A/P)	10,000	5,000JMD/time x 2times
	(2) Payment commission	1,475,000	0.1% of Total Project Cost
8	New frequencies for the Microwave Link and new UHF frequencies for the Radio Repeater Stations including necessary arrangement for allocation of those frequencies	0	Processing Fee: 45,000JMD Spectrum Fee: 12,610,000JMD (To be exempted)
9	To ensure that custom duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the Products and/or the Services be exempted, such as, (1) Import Duties, (2) Customs administration Fee (CAF), (3) General Consumption Tax, (4) Withholding Tax on Special Services (5) Contractors Levy (6) Environmental Levy (7) Standard Compliance Fee	0	To be exempted
	Total:	**9,875,000**	

Source: JICA Project Team

(3) Estimation Conditions

1) Estimation timing: April 2016

2) Exchange rates: 1 US$＝116.35 JPY
1 JMD＝0.955 JPY
1 US$＝120.84 JMD

(4) Others

The Project is implemented in accordance with the system of Japan's Grant Aid. The above cost estimation does not assure the ceiling cost on the E/N and shall be reviewed by the Government of Japan before the conclusion of E/N between the both governments.

2-5-2 Operation and Maintenance Cost

In order for ODPEM to continue sound operations, it will be necessary to appropriately upgrade the equipment that is procured by the Project in the future. Therefore, in addition to the maintenance cost of new and existing equipment, it will be necessary to compile a maintenance plan that also includes the periodic equipment upgrading costs.

(1) Setting Criteria

ODPEM is a subordinate agency of the Ministry of Local Government and Community Development (MLGCD), hence its annual budget is included in the MLGCD budget. Since all revenue will come from the national budget, basically three-year expenditure plans are prepared and applied for. Accordingly, a three-year expenditure plan has been prepared concerning maintenance in the Project too.

(2) Expenditure

The equipment to be procured by the Project will start operation in 2018, and the annual operation and maintenance costs are estimated as shown in Table 2-5-1.

1) Power Tariffs

Basically, the Project site owners and relevant agencies that use equipment will pay the power tariffs of radio equipment procured in the Project. Accordingly, ODPEM will only need to budget for the power tariffs it will directly bear at Sliogoville Station.

2) Maintenance

The cost of maintaining the air conditioning equipment to be installed at the new radio repeater station huts in the Project will be appropriated. Since air conditioner inspections are important for maintaining the environment in which radios can operate appropriately, it will be necessary to implement periodic maintenance.

3) Rent for the Existing Repeater Station Hut

In the seventeen (17) stations among the total twenty-four (24) stations under the Project, the new equipment will be installed in the existing repeater station hut. No cost will be basically charged for the use of the existing repeater station hut for this purpose in those locations, except Planters Hall Station, as well as the remaining seven (7) stations where the new concrete hut (6 stations) or the outdoor rack (1 station) is planned without using the existing repeater station hut under the Project.

4) Spare Parts and Consumable Parts

Based on the anticipated quantities of spare parts and consumable parts described in section 3-4 paragraphs (3) and (4), the cost of purchasing the spare parts and consumable parts by ODPEM following Project implementation will be appropriated upon referring to the equipment prices in the rough Project cost estimation. In addition to these, the annual fuel cost for vehicles used in conducting periodic inspections of equipment will be appropriated as follows:

- Radio repeater stations: Once per year x 24 sites = 24 times
- Fixed radios: 109 sites/35 days = 35 times
- Parish radio base stations: Once per year x 14 sites = 14 times
- Early warning system: Once per year x 3 areas = 3 times
- Equipment breakdown response: Twice per month x 12 months = 24times

The projected fuel cost in each periodic inspection is as follows:

- Travel distance 400 km × fuel cost 5 km / L×125JMD / L = 10,000JMD

Table 2-5-1 Annual Maintenance Cost

No.	Item	Unit Price (JMD)	Quantity	Total price (JMD)
1.	Electricity Cost			
(1)	Repeater Stations (only Sliogoville owned by DIGICEL)	1,500	12 months	18,000
(2)	Two-Way Radio Terminal and Integrated Command and Control Station	Borne by user	-	0
(3)	NWA Core Backbone Network	Borne by NWA	-	0
(4)	Application Fee for UHF frequencies (To be exempted)	45,000	-	0
(5)	Usage Fee for UHF frequencies (To be exempted)	12,610,000	-	0
2.	Maintenance and Repairing Cost			
(1)	Air Conditioning	20,000	5 locations	100,000
(2)	Electrical materials	35,000	5 locations	175,000
3.	Rent for Repeater Station Hut			
	Repeater Station Hut (only Planters Hall owned by COMTRON)	25,000	1 year	25,000
4.	Spare Parts, Consumable Parts,etc.			
(1)	Antenna System for UHF Repeater Station	180,000	5 sets	900,000
(2)	Antenna System for Base Radio	48,000	16 sets	768,000
(3)	Antenna for Mobile Radio	3,000	31 sets	93,000
(4)	Antenna for Handheld Radio	1,000	100 sets	100,000
(5)	Battery for Handheld Radio	3,000	200 sets	600,000
(6)	Fuel Cost of Vehicle for inspection	10,000	100 times	1,000,000

	Sub-total of O&M cost (1.+2.+3.+4.)			**3,779,000**
5.	Personnel Expenses			
	Additional Engineer in ODPEM		1 person	5,000,000
	Total (1.+2.+3.+4.+5.)			**8,779,000**

Source: JICA Project Team

(3) Saving for Equipment Renewal Cost

As was mentioned in section 2-4 paragraph (1), the reserve fund necessary for upgrading the main equipment of DECOM 10 years after the start of operation has been estimated. Table 2-5-2 shows the breakdown of the main equipment renewal costs projected from the equipment prices in the rough Project cost estimation.

Table 2-5-2 Equipment Renewal Reserve Costs

Item	Quantity	Total price (JMD)
Radio Repeater Station	1 lot	62,220,000
Microwave Link	1 lot	43,361,000
Power Supply System for Fixed UHF Repeater Station	1 lot	29,380,000
Two-Way Radio Terminal	1 lot	58,251,000
Integrated Command and Control Station	1 lot	15,069,000
Early Warning System	1 lot	15,197,000
Total cost to renew the above Equipment for 10years		**223,478,000**
Annual deposit for renewal cost of the main Equipment		**22,347,800**

Source: JICA Project Team

As is indicated above, approximately 22,348,000 JMD will need to be added to the reserve fund for equipment renewal each year.

(4) Securing of Operation and Maintenance Costs and Renewal Costs for the Project Equipment

The maintenance costs of equipment supplied in the Project are scheduled to be borne by ODPEM and the relevant agencies that will use the radio equipment, however, ODPEM will bear the abovementioned renewal costs. The annual maintenance cost of approximately 8.8 million JMD shown in Table 2-5-1 is equivalent to approximately 111% of the equipment maintenance cost in fiscal 2014/15, and approximately 4% of the total expenditure in that year (approximately 244.6 million JMD) in the same table. As for the equipment renewal cost, as was shown in Table 2-5-2, it is estimated at approximately 223.5 million JMD at current prices, and this is approximately 22 times higher than the equipment investment cost (budget for purchase of fixed assets) in fiscal 2014/15.

In order to sustain stable operation while securing the funds to renew the main DECOM equipment 10 years after the start of operation, ODPEM should establish a reserve fund and start adding approximately 22.3 million JMD to this each year from fiscal 2018/19. Table 2-5-3 shows the ODPEM budget plan including the equipment maintenance cost and renewal cost expected to rise due to the Project.

Table 2-5-3 ODPEM Budget Plan

('000 JMD)

Budget Items of Grant for Direction and Administration		2015/16	2016/17	2017/18	2018/19	2019/20
Compensation of Employees		103,533	103,533	115,404	117,991	120,643
Additional Engineer in ODPEM		-	-	-	5,000	5,000
Travel Expenses and Subsistence		25,391	25,391	25,391	32,193	32,193
Rental of Property and Machinery		5,156	5,156	5,178	5,200	5,224
Utilities and Communication Services		23,110	23,110	24,116	25,178	26,298
Use of Goods and Services		63,622	63,622	67,121	70,813	74,708
Capital Goods		1,755	1,755	1,852	1,953	2,061
Additional Budget for the Equipment to be provided by the Project	O&M Cost	-	-	-	3,779	3,779
	Deposit for Renewal Cost Account	-	-	-	22,348	22,348
Total		**222,567**	**222,567**	**239,062**	**284,455**	**292,254**

Source: JICA Project Team

The maintenance cost is expected to rise suddenly from fiscal 2018/19; hence ODPEM will need to hold advance discussions with the MLGCD and Ministry of Finance and Public Service concerning the increased budget; compile an estimate of the necessary budget amount, and make the budget application.

Moreover, depending on the method that ODPEM adopts to establish the reserve fund for equipment renewal, a certain amount for adding to the fund will be included in each year's budget application, and the necessary funds will be saved and issued as required. Concerning the procedure for establishing the fund, ODPEM will seek permission upon making the application for the fund together with materials demonstrating the project contents, income and expenditure plan, and necessary annual budget (each year's reserve amount). Concerning the equipment renewal cost shown in Table 2-5-2, Table 2-5-4 shows the fund income and expenditure plan that is estimated based on the following conditions.

a) All equipment will be renewed in the final year of the service life (10 years), i.e. 2027/28.

b) The fund will be established in 2018/19 and will be paid in to every year for 10 years from fiscal 2018/19 to 2027/28.

c) The equipment renewal cost will be estimated based on current prices as of 2015/16, without taking inflation over the target period into account.

Table 2-5-4 Equipment Renewal Fund Income and Expenditure Plan (Draft)

('000 JMD)

Fiscal Year	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027/28**
Revenue (Fund Deposit Budget)	22,348	22,348	22,348	22,348	22,348	22,348	22,348	22,348	22,348	22,346
Expenditure (Renewal Cost)	-	-	-	-	-	-	-	-	-	223,478
Accumulated Value	22,348	44,696	67,044	89,392	111,740	134,088	156,436	178,784	201,132	0

Source: JICA Project Team

Since the equipment renewal cost (approximately 223,478,000 JMD) represents 91.4% of total expenditure in 2014/15 (244,576,000 JMD), it is desirable to establish the abovementioned reserve fund to cover this. Also, it will be possible to invest the annual reserve in a manner that enables additional funds to be gained from interest earnings and so on.

CHAPTER 3 PROJECT EVALUATION

Chapter 3 Project Evaluation

3-1 Preconditions

- The Scope of Works on the Jamaican side shown in the Table in section 2-5-1-2 are implemented smoothly

3-2 Necessary Inputs by Recipient Country

- The site required for installation of the equipment of the Project (DECOM and EWANS) are secured.
- The frequencies required for the radio equipment procured in the Project are secured.
- The NWA Core IP Backbone Network is appropriately operated.
- ODPEM continues to conduct operations based on the warning issue procedure in disasters.
- The disaster observation, information analysis and evaluation activities by the agencies are continued.
- ODPEM commences operation based on the operating procedures for the equipment procured in the Project.
- ODPEM concludes agreements with Parish Councils, police stations, fire stations, hospitals, and other disaster prevention agencies concerning the operation, maintenance, routine inspections and costs of the radio equipment to be procured in the Project.
- ODPEM provides the necessary budget for maintaining the radio equipment to be procured in the Project, and it also provides the locations, personnel and budget needed to conduct technical guidance on operation and maintenance to Parish Councils, police stations, fire stations, hospitals, and other disaster prevention agencies.

3-3 Important Assumptions

- Policies relating to disaster management remain conductive to the implementation of the Project.
- There are no major natural disasters such as earthquake, etc. and no sudden incidents such as acts of terrorism, etc. before or during implementation of the Project.

3-4 Project Evaluation

3-4-1 Relevance

Since the Project will contribute to disaster prevention in Jamaica as indicated below, implementation of the Project is deemed to be highly valid.

(1) Benefiting Population

In the Project, through building the DECOM digital radio network comprising 24 radio repeater stations at 24 sites in Jamaica, providing radio terminals and radio base stations to Parish Councils and public agencies such as police stations, fire stations, hospitals, etc. all

over the country, and introducing EWANS to communities that are vulnerable to tsunami, flooding and other disasters, it will become possible to more rapidly provide disaster and disaster prevention information to approximately 2,721,000 residents (in 2014, according to the World Bank) in Jamaica.

Concerning national plans in the disaster prevention field in Jamaica, grasping of flood disaster risks is cited as a priority policy in Vision 2030 Jamaica. Since the Project is categorized under "Mitigation of disaster risks and adaptation to climate change," it will contribute toward Jamaica's development plans.

(2) Necessity and Advantage of Using Japanese Technology

The main equipment to be procured in the Project is manufactured in Japan, the United States and European countries. Japanese radios boast a large share in international markets; moreover, because they are designed with low power consumption and are resistant to water and dust, they are especially advantageous during disasters. Moreover, because the post-sales service setup for responding to breakdowns, conducting repairs and procuring spare parts is established, such products can be used over the long term both inside and outside of Japan. Accordingly, it is both necessary and technical advantageous to use Japanese products when renewing the equipment of the Project; moreover, the Project can be expected to have an effect in terms of disseminating Japanese products.

3-4-2 Effectiveness

(1) Quantitative Effects

The present disaster radio network in Jamaica comprises fixed radio devices and mobile radio devices of differing types, frequencies and specifications that have been procured separately by different organizations, meaning that there is no compatibility for mutual communications and making it difficult to maintain the system. In the Project, through supplying radio equipment to the radio repeater stations and public agencies that serve as disaster prevention hubs, the effects described below are anticipated. Reference values are based on the existing radio network as of 2016, while the target values envisage the radio network three years after the Project completion.

1) Increase in communication capacity

Table 3-4-1 Comparison the number of Radio Repeater Stations between 2016 and After Implementation of the Project

Indicator	Reference value (2016)	Target value (2021)
Number of Voice line (exclude a control channel)	1 channel for all over the country	3 or 6 channels per Radio Repeater Station

2) Expansion of receiving coverage

Jamaica is an island nation with area equivalent to Akita Prefecture in Japan. The centre of the country consists of mountains and valleys and has traditionally had a prosperous coffee growing industry that exploits these topographical features. Many of the people who are engaged in such farming live in mountain communities that are vulnerable to disasters. Meanwhile, in coastal areas, many residents are engaged in small-scale fisheries and tourism, and since flatland suitable for residence can only be found in such coastal areas, the people live in an environment that is prone to the damaging effects of hurricane surges and tsunami. It has been needed for a radio network for disaster prevention in Jamaica, however, because disaster prevention centres such as Parish Councils, police stations, fire stations and so on are mostly located in mountainous areas or narrow coastal strips close to hilly ground, where it is difficult for radio waves to reach, radio networks only have limited coverage. In the Project, through constructing additional radio repeater stations with a view to extending coverage nationwide, more public agencies and communities will come to utilize radio communications, and the following quantifiable effects are anticipated.

Table 3-4-2 Comparison the coverage between 2016 and After Implementation of the Project

Indicator	Reference value (2016)	Target value (2021)
Coverage for Community in Disaster Vulnerable Area	20-25%	90-95%

3) Speeding-up of information transmission (in case of radio communications)

In the existing analogue radio network, only one channel can be used; moreover, equipment deterioration has led to line instability. In order to realize speedier communications, it is necessary to compensate with mobile phones or communicate through police and fire department radio lines, thereby incurring additional time and effort. In the Project, however, through installing DECOM, it will become possible for the ODPEM National Emergency Operations Centre (NEOC) to instantaneously transmit the same information to Parish Emergency Operations Centres (PEOC), thereby enabling emergency communications and status reports between centres during disasters to be promptly communicated.

Table 3-4-3 Comparison the performance of information transmission between 2016 and After Implementation of the Project

Indicator	Reference value (2016)	Target value (2021)
Number of organizations of Disaster-Emergency Communication System (DECOM)	20	52
Transmission standard time (From ODPEM to Communities)	60 minutes	Less than 5 minutes

4) Establishment of a communications network for disaster information to residents

Through introducing a siren system, it will be possible to conduct effective evacuation guidance. Since the sirens will be routinely used to call out to residents, this will promote dissemination and heightened awareness in disaster prevention and encourage evacuation training.

Table 3-4-4 Comparison the effects of Siren System between 2016 and After Implementation of the Project

Indicator	Reference value (2016)	Target value (2021)
Beneficiaries by Siren System (researched by JICA Project Team)	Approximately 2,600 residents	Approximately 16,000 residents

(2) Qualitative Effects (Project overall)

1) Securing of a dedicated/stable disaster prevention network

In Jamaica, since private sector mobile phone networks are widely disseminated, people depend on mobile phones for conducting routine communications. At times of disaster, there is concern that because people and various agencies will use mobile phones at the same time, the urgent orders, communications and so on from ODPEM will not reach the Parish Councils, police stations, fire stations and hospitals. Accordingly, in the Project, it is intended to establish ① the nationwide disaster radio network (ODPEM ⇔ disaster prevention centres such as parishes, police, etc.), and ② the local disaster radio network (Parishes ⇔ communities and shelters), thereby securing dedicated lines for those network and realizing speedy and stable information communications at times of disaster.

2) Disaster prevention effect

Through establishing a digital radio system, the Project will establish a communications setup serving all disaster prevention agencies in Jamaica centred on ODPEM and facilitate routing information exchange and linkage. Moreover, installation of a siren system will make it possible to convey information to residents and promptly convey evacuation orders to residents living in vulnerable coastal and mountainous areas. Furthermore, at ordinary times, it will be easier to make appeals concerning disasters to residents, conduct evacuation training and heighten awareness, thereby establishing rapid evacuation setups in readiness for disasters and mitigating human losses among the Jamaican people in the event of disaster.

Appendices

A1. Member List of the Study Team

1. Member List of the Study Team

Name	Work Assignment	Position
Mr. Masayuki FURUKAWA	Leader	Deputy Director Team1.Transportation and ICT Group Infrastructure and Peacebuilding Department JICA
Mr.Tatsuya KOBAYASHI	Chief Consultant /Operating& Maintenance Planning 1	Yachiyo Engineering Co., Ltd.
Mr.Kiyofusa TANAKA	Sub Chief Consultant /Operating& Maintenance Planning 2	Yachiyo Engineering Co., Ltd.
Mr.Masato TAMURA	Disaster Observation Planning 1 (Radio)	Yachiyo Engineering Co., Ltd.
Mr.Hiroshi SHIMOOSAKO	Disaster Observation Planning 2	Yachiyo Engineering Co., Ltd.
Mr.Kazuhiko HARIKAE	Information Network Planning 1/Installation Planning 1	Yachiyo Engineering Co., Ltd.
Mr.Masao MIKAMI	Disaster Observation Planning 3 / Information Network Planning 1	Yachiyo Engineering Co., Ltd.
Mr.Mitsunobu KOISO	Disaster Observation Planning 4 (Radio)	Yachiyo Engineering Co., Ltd.
Mr.Kentaro NAKAMURA	Disaster Observation Planning 5	Yachiyo Engineering Co., Ltd.
Mr.Daichi KANAZASHI	Site Conditions Survey 1 /Installation Planning 2 (Construction)	Yachiyo Engineering Co., Ltd.
Mr.Osamu UCHIDA	Information Network Planning 3 /Installation Planning 3	Yachiyo Engineering Co., Ltd.
Mr.Akria MARUYAMA	Site Conditions Survey 2 /Installation Planning 4 (Construction)	Yachiyo Engineering Co., Ltd.
Mr.Naoto NOGUCHI	Site Conditions Survey 3 /Installation Planning 5 (Electric field strength)	Yachiyo Engineering Co., Ltd.
Mr.Masaki TANAKA	Site Conditions Survey 4 /Installation Planning 6 (Electric field strength)	Yachiyo Engineering Co., Ltd.
Mr.Izumi TAKAI	Financial Analysis	Yachiyo Engineering Co., Ltd.
Mr.Yosuke IKEDA	Procurement Planning /Cost Estimation	Yachiyo Engineering Co., Ltd.

Name	Work Assignment	Position
Mr.Chiaki MATSUMOTO	Disaster Information /Social Conditions Survey	Yachiyo Engineering Co., Ltd.
Mr.Yoshiyuki CHOSO	Disaster Information /Social Conditions Survey	Yachiyo Engineering Co., Ltd.

A2. Study Schedule

2. Study Schedule

1st Field Survey

No.	Date		Survey Content									Stay at
			JICA Jituya ISHIGURO	JICA Masayuki FURUKAWA	Group-A		Group-B			Group-C		
					YEC Tatsuya KOBAYASHI	YEC Kiyofusa TANAKA	YEC Masato TAMURA	YEC Kazuhiko HARIKAE	YEC Chiaki MATSUMOTO	YEC Hiroshi SHIMOOSAKO	YEC Masao MIKAMI	
Person in Charge			Leader	Cooperation Planning	Chief Consultant /Operating& Maintenance Planning1	Sub Chief Consultant /Operating& Maintenance Planning2	Disaster Observation Planning1	Information Network Planning1 /Installation Planning1	Disaster Information/Social Conditions Survey	Disaster Observation Planning2	Disaster Observation Planning3/Information Network Planning2	
1	2015-07-09	Thu			Trip [Narita 10:40→ Dallas 8:50, AA176] Trip [Dallas 10:25 → Miami 14:25, AA2307] Trip [Miami 17:05→ Kingstone 17:53,AA1082]							Kingston
2	2015-07-10	Fri			・15:30 Meeting at JICA Kingston Branch Office ・17:00 Meeting with JICA Expert at Hotel(Mr.Nishimura)							Kingston
3	2015-07-11	Sat	Trip		・Team Meeting							Kingston
4	2015-07-12	Sun	Trip ・Team Meeting		・Team Meeting						Trip [Narita 10:40→ Dallas 8:50, AA176] Trip [Dallas 10:25 → Miami 14:25, AA2307] Trip [Miami 17:05→ Kingston 17:53,AA1082]	Kingston
5	2015-07-13	Mon	・10:00 Meeting at JICA Kingston Branch Office ・14:00 Discussion with ODPEM, NWA, MOFA, MOF and PIOJ (Inception Report, Collection of Answers to Questionnaires, Requested Equipment, Schedule of Survey, etc.) ・Discussion with ODPEM and NWA, (Operating& Maintenance Planning, number of Staffs, Budget) ・Survey of existing facilities (Planning Siren site, Repeater site, FM Broadcasting station, etc)									Kingston
6	2015-07-14	Tue	・Discussion on M/D -(1)				・ Survey of existing facilities(Repeater Site) ・ Survey of existing facilities(FM Radio Broadcasting Station, Transmitting Station) ・ Discussion with FM Radio Broadcasting station about technical matter			・ Survey of existing Monitoring facilities(River level, Landslides,etc) ・ Survey of existing Monitoring facilities(Tide level, seismograph) ・ Survey of Disaster Prevention Activities		Kingston
7	2015-07-15	Wed	・Discussion on M/D -(2)									Kingston
8	2015-07-16	Thu	・Conclude M/D (Sign) ・Report to Embassy of Japan in Kingston ・Report to JICA Kingston Branch Office									Kingston
9	2015-07-17	Fri	Trip [Kingston → Miami]		・Making Field Report							Kingston
10	2015-07-18	Sat	Trip [Miami 9:15→]		・Making Field Report							Kingston
11	2015-07-19	Sun	Trip [→ Narita16:35,AA061]		・Making Field Report							Kingston
12	2015-07-20	Mon			・Meeting with ODPEM and NWA	・Meeting with ODPEM and NWA	・ Survey of existing facilities(Repeater Site) ・ Survey of existing facilities(FM Radio Broadcasting Station, Transmitting Station) ・ Discussion with FM Radio Broadcasting station about technical matter			・ Survey of existing Monitoring facilities(River level, Landslides,etc) ・ Survey of existing Monitoring facilities(Tide level, seismograph) ・ Survey of Disaster Prevention Activities		Kingston
13	2015-07-21	Tue			Trip [Kingston 14:30→ Miami 17:28,AA958]							Kingston
14	2015-07-22	Wed			Trip [Miami 9:15→]							Kingston
15	2015-07-23	Thu			Trip [→ Narita16:35,AA061]	・Meeting with ODPEM and NWA ・Making Field Report						Kingston
16	2015-07-24	Fri				・Explanation Field Report						Kingston
17	2015-07-25	Sat				・Making Field Report						Kingston
18	2015-07-26	Sun				・Making Field Report						Kingston
19	2015-07-27	Mon				・Conclude Field Report (Sign) with ODPEM and NWA ・Report to Embassy of Japan in Kingston ・Report to JICA Kingston Branch Office						Kingston
20	2015-07-28	Tue				Trip [Kingston 14:30→ Miami 17:28,AA958]						Miami
21	2015-07-29	Wed				Trip [Miami 9:15→]						On Flight
22	2015-07-30	Thu				Trip [→Narita16:35,AA061]						-

2nd Field Survey

No.	Date		Survey Content																	
		JICA M. FURUKAWA	Chief Consultant Group		Group A Team-A1		Group B Team-B1		Group A Team-A2		Group B Team-B2		Group C		Group D			Group E	Stay at
			T. KOBAYASHI	K. TANAKA	M. TAMURA	D. KANAZASHI	K. HARIKAE	N. NOGUCHI	M. KOISO	A. MARUYAMA	K. NAKAMURA	M. TANAKA	O. UCHIDA	Y. IKEDA	H. SHIMOOSAKO	Y. CHOSO	I. TAKAI	Local	
Person in Charge		Leader /Cooperation Planning	Chief Consultant /Operating& Maintenance Planning 1	Sub Chief Consultant /Operating& Maintenance Planning 2	Disaster Observation Planning 1 (Radio)	Site Conditions Survey 1 /Installation Planning 2 (Construction)	Information Network Planning 1 /Installation Planning 1	Site Conditions Survey 3 /Installation Planning 5 (Electric field strength)	Disaster Observation Planning 4 (Radio)	Site Conditions Survey 2 /Installation Planning 4 (Construction)	Disaster Observation Planning 5	Site Conditions Survey 4/Installation Planning 6 (Electric field strength)	Information Network Planning 3 /Installation Planning 3	Procurement Planning /Cost Estimation	Disaster Observation Planning 2	Disaster Information /Social Conditions Survey	Financial Analysis	Plane table survey Bowling survey	
1	18-Feb	Thu	Trip [Narita 18:35 → Vancouver 10:35, JL018] Trip [Vancouver 14:00 → Toronto 21:20, AC102]		Trip [Narita 11:30 → Dallas 8:10, AA176] Trip [Dallas 10:35 → Miami 14:18, AA2307] Trip [Miami 18:35 → Kingston 20:20, AA1082]		Trip [Narita 11:30 → Dallas 8:10, AA176] Trip [Dallas 10:35 → Miami 14:18, AA2307] Trip [Miami 18:35 → Kingston 20:20, AA1082]			Trip [Narita 11:30 → Dallas 8:10, AA176] Trip [Dallas 10:35 → Miami 14:18, AA2307] Trip [Miami 18:35 → Kingston 20:20, AA1082]					Trip [Narita 11:30 → Dallas 8:10, AA176] Trip [Dallas 10:35 → Miami 14:18, AA2307] Trip [Miami 18:35 → Kingston 20:20, AA1082]				Kingston
2	19-Feb	Fri	Trip [Toronto 08:35 → Kingston 12:45, AC1802] -Discussion with ODPEM -16:00 Meeting at JICA Jamaica Office		-Discussion with ODPEM -Meeting at JICA Jamaica Office		-Discussion with ODPEM -Meeting at JICA Jamaica Office			-Discussion with ODPEM -Meeting at JICA Jamaica Office					-Discussion with ODPEM -Meeting at JICA Jamaica Office -Collecting Information -Making Appointment with Local Coordinator				Kingston
3	20-Feb	Sat	-Team Meeting		-Checking the Equipment for Electric Field Strength Measurement		-Checking the Equipment for Electric Field Strength Measurement			-Team Meeting					-Team Meeting				Kingston
4	21-Feb	Sun	-Team Meeting		-Team Meeting		-Team Meeting			-Team Meeting					-Team Meeting				Kingston
5	22-Feb	Mon	-Visit to Embassy of Jamaica -Discussion with ODPEM		-Visit to Embassy of Jamaica -Discussion with ODPEM -Confirmation locations of Repeaters Site and NWA Repeaters Site		-Visit to Embassy of Jamaica -Discussion with ODPEM -Confirmation locations of Base Station			-Visit to Embassy of Jamaica -Discussion with ODPEM					-Visit to Embassy of Jamaica -Discussion with ODPEM				Kingston
6	23-Feb	Tue	-Discussion with ODPEM		-Discussion with ODPEM, about Survey Route, Schedule -Preparation for Survey		-Discussion with ODPEM, about Survey Route, Schedule -Preparation for Survey			-Preparation for Vehicle, Mobile Phone -Discussion with ODPEM, about Survey Route, Schedule -Preparation for Survey					-Discussion with ODPEM -Collecting Information -Making Appointment with Local Coordinator				Kingston
7	24-Feb	Wed				Trip [Haneda 18:50 → Toronto 16:45, AC006]													Kingston
8	25-Feb	Thu																	Kingston Toronto
9	26-Feb	Fri		Trip [Narita 11:30 → Dallas 8:10, AA176] Trip [Dallas 10:35 → Miami 14:18, AA2307] Trip [Miami 18:35 → Kingston 20:20, AA1082]		Trip [Toronto 08:35 → Kingston 12:45, AC1802]			Trip [Narita 11:30 → Dallas 8:10, AA176] Trip [Dallas 10:35 → Miami 14:18, AA2307] Trip [Miami 18:35 → Kingston 20:20, AA1082]					Trip [Narita 11:30 → Dallas 8:10, AA176] Trip [Dallas 10:35 → Miami 14:18, AA2307] Trip [Miami 18:35 → Kingston 20:20, AA1082]			Trip [Narita 11:30 → Dallas 8:10, AA176] Trip [Dallas 10:35 → Miami 14:18, AA2307] Trip [Miami 18:35 → Kingston 20:20, AA1082]		Kingston
10	27-Feb	Sat	-Team Meeting				-Team Meeting		-Team Meeting					-Team Meeting					Kingston
11	28-Feb	Sun	-Team Meeting						-Team Meeting					-Team Meeting					Kingston
12	29-Feb	Mon	-Discussion with ODPEM for Site Survey		-Discussion with ODPEM, about Survey Route, Schedule -Preparation for Survey -Meeting at JDS	-Preparation of contract for Site Topological Survey and Soil Explanation -Preparation for the Site Survey	-Discussion with ODPEM, about Survey Route, Schedule -Preparation for Survey -Meeting at JDS	Trip [Narita 11:30 → Dallas 8:10, AA176] Trip [Dallas 10:35 → Miami 14:18, AA2307] Trip [Miami 18:35 → Kingston 20:20, AA1082]	-Preparation for Survey		Trip [Narita 11:30 → Dallas 8:10, AA176] Trip [Dallas 10:35 → Miami 14:18, AA2307] Trip [Miami 18:35 → Kingston 20:20, AA1082]			-Discussion with ODPEM, about Survey Route, Schedule -Preparation for Survey	-Discussion with ODPEM -Collecting Information -Making Appointment with Local Coordinator			Kingston
13	1-Mar	Tue	-Discussion with ODPEM about Survey Route,Schdule -Meeting at UNDP		-Discussion with ODPEM, about Survey Route, Schedule -Preparation for Survey -Meeting at UNDP		-Discussion with ODPEM, about Survey Route, Schedule -Preparation for Survey				-Preparation for Survey		-Preparation for Survey						Kingston
14	2-Mar	Wed	-As same as TeamD	-As same as TeamA	-Repeater Site 10 (Yallahs Hill)		-Base station at the Coverage of Repeater Site 10 (St.Thomas)		-Repeater Site 10 (Yallahs Hill)		- Base Station at the Coverage of Repeater Site 10 (St.Thomas)		-Base Station at the Coverage of Repeater Site 10 (St.Thomas)		-Siren Site (St.Catherine)				Kingston
15	3-Mar	Thu		-As same as TeamC	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Base station at the Coverage of Repeater Site 11 (Kingston and St.Andrew)		-Repeater Site 11 (Cabbage Hill)		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Base Station at the Coverage of Repeater Site 11(Kingston and St.Andrew)		-Disaster Prone Area (Kingston and St.Andrew)				Kingston
16	4-Mar	Fri		-Discussion with ODPEM about Management Plan for Radio Equipment	-Repeater Site 9 (Needhams Pen) -Repeater Site 30 (Winchester)		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		- Base Station at the Coverage of Repeater Site 9 (St.Thomas) - Base Station at the Coverage of Repeater Site 30 (St.Thomas and Portland)		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Disaster Prone Area (St.Thomas)				Kingston
17	5-Mar	Sat	-Team Meeting																Kingston
18	6-Mar	Sun	-Team Meeting																Kingston
19	7-Mar	Mon	-As same as TeamC	-Making Report	-Repeater Site 3 (Bonny Gate)		-Base Station at the Coverage of Repeater Site 3 (St.Mary and St.Ann)		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Base Station at the Coverage of Repeater Site 3(St.Mary and St.Ann)		-Discussion with ODPEM -Collecting Information -Making Appointment with Local Coordinator		Trip [Narita 11:30 → Dallas 8:10, AA176] Trip [Dallas 10:35 → Miami 14:18, AA2307] Trip [Miami 18:25 → Kingston 20:10, AA1082]		Kingston
20	8-Mar	Tue	-As same as TeamA	-As same as TeamD	-Repeater Site 7(Castle Mountain) -Repeater Site 6 (Shotover)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Repeater Site 7 (Castle Mountain) -Repeater Site 6 (Shotover)		- Base Station at the Coverage of Repeater Site 7 (Portland) - Base Station at the Coverage of Repeater Site 6 (Portland)		- Base Station at the Coverage of Repeater Site 7(Portland) - Base Station at the Coverage of Repeater Site 6(Portland)		-Siren Site (St.Catherine) -Disaster Prone Area (St.Catherine)		-Financial Analysis -Collecting Information		Kingston
21	9-Mar	Wed	-As same as TeamD	-Discussion with ODPEM	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Base Station at the Coverage of Repeater Site 2(St.Ann)		-Repeater Site 2 (Murphy Hill)		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Siren Site (St.Mary) -Disaster Prone Area (St.Mary)				Kingston
22	10-Mar	Thu	-Making Report		-Repeater Site 1 (Bamboo) -NWA Repeater Site 6 (Bamboo NWA)		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Base Station at the Coverage of Repeater Site 1 (St.Ann) -Base Station at the Coverage of NWA Repeater Site 6 (St.Ann)		-Base Station at the Coverage of Repeater Site 1 (St.Ann) -Base Station at the Coverage of NWA Repeater Site 6 (St.Ann)		-Disaster Prone Area (Portland)				Kingston
23	11-Mar	Fri	-Visiting to JOSV -Discussion with ODPEM		-Repeater Site 29 (Duncans)		-Base Station at the Coverage of Repeater Site 29(Trelawny)				-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Interview with Japan Overseas Cooperation Volunteers				Kingston
24	12-Mar	Sat	-As same as TeamA	-Team Meeting	-Repeater Site 11 (Cabbage Hill)		-Team Meeting												Kingston
25	13-Mar	Sun	Trip [Kingston → Montego Bay]																Montego Bay Kingston
26	14-Mar	Mon	-Making Report -Checking Survey Data Sheet -Planing Equipment Component	-Making Report	-Repeater Site 27 (Kempshot) -NWA Repeater Site 5 (Kempshot NWA) -Repeater Site 28 (Flower Hill)		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		- Base Station at the Coverage of Repeater Site 27 (St.James) - Base Station at the Coverage of NWA Repeater Site 5 (St.James) - Base Station at the Coverage of Repeater Site 28 (St.James)		- Base Station at the Coverage of Repeater Site 27 (St.James) - Base Station at the Coverage of NWA Repeater Site 5 (St.James) - Base Station at the Coverage of Repeater Site 28 (St.James)		-Disaster Prone Area (Hanover)		-Financial Analysis -Collecting Information		Montego Bay Kingston
27	15-Mar	Tue		-As same as TeamD	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Base Station at the Coverage of Repeater Site 26 (Hanover)		-Repeater Site 26 (Birches Hill)		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Disaster Prone Area (Westmoreland)				Montego Bay Kingston
28	16-Mar	Wed			-Alternative Repeater Site 4 (Free Hill)		-Base Station at the Coverage of Alternative Repeater Site 4 (St.Ann and Trelawny)		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Base Station at the Coverage of Alternative Repeater Site 4 (St.Ann and Trelawny)		-Base Station at the Coverage of Alternative Repeater Site 4 (St.Ann and Trelawny)		-Disaster Prone Area (Trelawny)				Montego Bay Kingston
29	17-Mar	Thu		-Planing Renovation of Existing Repeater Site Hut	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Repeater Site 24 (Mount Airy)		-Base Station at the Coverage of Repeater Site 24(Westmoreland)		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Repeater Site 24 (Mount Airy)	-Disaster Prone Area (St..Ann)				Montego Bay Kingston
30	18-Mar	Fri			-Repeater Site 23 (Shafton)		-Base Station at the Coverage of Repeater Site 23 (Westmoreland and St.Elizabeth)		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Base Station at the Coverage of Repeater Site 23 (Westmoreland)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Disaster Prone Area (St.James)				Montego Bay Kingston
31	19-Mar	Sat	-Team Meeting																Montego Bay Kingston

32	20-Mar	Sun	Trip [Montego Bay→ Black River]																Black River Kingston
33	21-Mar	Mon	-Making Report -Checking Survey Data Sheet -Planing Equipment Component	-Planing Siren System	-Repeater Site 19 (Huntley)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Base Station at the Coverage of Repeater Site 19 (Manchester)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Repeater Site 19 (Huntley)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Base Station at the Coverage of Repeater Site 19 (Manchester	-Repeater Site 19 (Huntley)	-Disaster Prone Area (Clarendon)	-Financial Analysis -Collecting Information					Black River Kingston
34	22-Mar	Tue		-Planing Network	-Repeater Site 18 (Ayr Hill) -NWA Repeater Site 3 (Ayr Hill NWA)		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Base Station at the Coverage of Repeater Site 18(Manchester and Clarendon)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Disaster Prone Area (St.Elizabeth)					Black River Kingston
35	23-Mar	Wed		-As same as TeamB	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Base Station at the Coverage of Repeater Site 18 (Manchester and Clarendon)			-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey			-Discussion with ODPEM -Collecting Information -Making Appointment with Local Coordinator					Black River Kingston
36	24-Mar	Thu		-Planing Equipment Component	-Repeater Site 21 (Newport) -Repeater Site 22 (Malvern)		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey			-Base Station at the Coverage of Repeater Site 21(St.Elizabeth) -Base Station at the Coverage of Repeater Site 22(St.Elizabeth)	-Base Station at the Coverage of Repeater Site 21 (St.Elizabeth) -Base Station at the Coverage of Repeater Site 22 (St.Elizabeth)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Disaster Prone Area in Manchester					Black River Kingston
37	25-Mar	Fri			-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey														Black River Kingston
38	26-Mar	Sat	Team Meeting																Black River Kingston
39	27-Mar	Sun	Trip [Black River→ Kingston]																Kingston
40	28-Mar	Mon	-Making Report -Checking Survey Data Sheet -Planing Equipment Component	-As same as TeamA	-Repeater Site 3 (Bonny Gate)		-Base Station at the Coverage of Repeater Site 3 (Kingston and St.Andrew)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Making Field Report	-Making Field Report	-Financial Analysis -Collecting Information			Kingston
41	29-Mar	Tue	-Plan for Transportation of the Equipment -Visiting to Storage and Workshop		-Repeater Site 15 (Coopers Hill) -NWA Repeater Site 2 (Coopers Hill NWA)		-Base Station at the Coverage of Repeater Site 15 (Kingston and St.Andrew and St.Mary)	-Repeater Site 15 (Coopers Hill)			-Base Station at the Coverage of Repeater Site 15 (Kingston and St.Andrew)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey			Trip [Kingston 12:00 → Miami 14:50, AA1545] Trip [Miami 16:49 → Dallas 19:12, AA2427]			Kingston
42	30-Mar	Wed	-Discussion with ODPEM about M/D		-Repeater Site 14 (Catherine's Peak)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Base Station at the Coverage of Repeater Site 14 (Portland)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Repeater Site 14 (Catherine's Peak)	-Base Station at the Coverage of Repeater Site 14 (Kingston and St.Andrew and St.Mary)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Repeater Site 14 (Catherine's Peak)		Trip [Kingston 12:00 → Miami 14:50, AA1545] Trip [Miami 18:10 → Dallas 20:34, AA398]	Trip [Dallas 10:40 →]			Kingston
43	31-Mar	Thu	-Discussion with TeamA -Discussion with ODPEM about Equipment Plan		-Repeater Site 16 (Planters Hall) -Repeater Site 13 (Juan-DE-Bolas)	-Preparation of Contract for Geological Survey -Making Report for Renovation of Existing Repeater Site Hut -Floor Layout Planning	-Base Station at the Coverage of Repeater Site 16 (Clarendon and St.Catherine) -Base Station at the Coverage of Repeater Site 13 (Clarendon and St.Catherine)		-Repeater Site 16 (Planters Hall) -Repeater Site 13 (Juan-DE-Bolas)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Base Station at the Coverage of Repeater Site 16 (Clarendon and St.Catherine) -Base Station at the Coverage of Repeater Site 13 (Clarendon and	-Repeater Site 16 (Planters Hall) -Repeater Site 13 (Juan-DE-Bolas)		Trip [Dallas 10:40 →]	Trip [→ Narita 14:00, AA175]		Kingston
44	1-Apr	Fri	-Discussion with ODPEM about M/D		-Repeater Site 20 (Sligoville)		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Repeater Site 20 (Sligoville)		-Base Station at the Coverage of Repeater Site 20 (St.Catherine)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey			Trip [→ Narita 14:00, AA175]			Kingston
45	2-Apr	Sat	-Site Survey,Montego Bay (Shortage)		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey			-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Site Survey,Montego Bay (Storage)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey						Kingston
46	3-Apr	Sun	-Making Field Report -Making 2nd Field Survey Result Summary																Kingston
47	4-Apr	Mon	-Making 2nd Field Survey Result Summary -Discussion with ODPEM about Field Report -Checking Field Report		-Repeater Site 12 (Marley Hill)	-Preparation of Contract for Geological Survey -Making Report for Renovation of Existing Repeater Site Hut -Floor Layout Planning	-Base Station at the Coverage of Repeater Site 12 (Kingston and St.Andrew)	-Repeater Site 12 (Marley Hill)		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Base Station at the Coverage of Repeater Site 12 (Kigston and St.Andrew)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification -Preparation for Survey	-Making Field Report					Kingston
48	5-Apr	Tue			-Repeater Site 17 (Portland Cottage Lighthouse)		-Base Station at the Coverage of Repeater Site 17 (Clarendon and Manchester)	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification	- Repeater Site 17 (Portland Cottage Lighthouse)	-Base Station at the Coverage of Repeater Site 17 (Clarendon and Manchester)	- Base Station at the Coverage of Repeater Site 17 (Clarendon and Manchester)	- Repeater Site 17 (Portland Cottage Lighthouse)						Kingston
49	6-Apr	Wed			-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification		-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification							Kingston
50	7-Apr	Thu			-Making Field Report		-Making Field Report	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification	-Making Field Report	-Making Field Report	-Making Field Report	-Floor Layout Planning -Equipment Installation Planning -Measurement Data Verification	-Making Field Report						Kingston
51	8-Apr	Fri						Trip [Kingston 11:55 → Miami 14:51, AA1545] Trip [Miami 17:35 → Dallas 19:45, AA207]			Trip [Kingston 11:55 → Miami 14:51, AA1545] Trip [Miami 17:35 → Dallas 19:45, AA207]								Kingston
52	9-Apr	Sat	Trip [Narita 10:40 → Dallas 8:25, AA176] Trip [Dallas 12:05 → Miami 15:58, AA206] Trip [Miami 18:14 → Kingston 19:05, AA1082]	-Making Field Report -Making 2nd Field Survey Result Summary				Trip [Dallas 10:45 →]	Trip [Kingston 11:55 → Miami 14:48, AA1545] Trip [Miami 18:10 → Dallas 20:29, AA207]		Trip [Dallas 10:45 →]								Kingston
53	10-Apr	Sun	-Team meeting	-Team meeting -Making Field Report -Making Second Field Survey Result Summary			-Team meeting -Making Field Report	Trip [→ Narita 16:35, AA175]	Trip [Dallas 10:40 →]	-Team Meeting -Making Field Report	Trip [→ Narita 16:35, AA175]								Kingston
54	11-Apr	Mon	-Meeting at JICA Jamaica Office -Discussion on M/D-(1)				-Making Field Report	-Preparation of Contract for Geological Survey -Making Field Report	-Making Field Report	Trip [→ Narita 14:00, AA175]	-Preparation of Contract for Geological Survey -Making Field Report	-Making Field Report		-Making Field Report	-Making Field Report				Kingston
55	12-Apr	Tue	-Discussion on M/D-(2)																Kingston
56	13-Apr	Wed	-Conclude M/D(sign) -Report to Embassy of Japan -Report to JICA Jamaica Office																Kingston
57	14-Apr	Thu	Trip [Kingston 8:00 → Miami 10:54, AA2370] Trip [Miami 14:02 → Los Angels 16:43, AA287] Trip [Los Angels18:40 →]	-Discussion with ODPEM about Report															Kingston
58	15-Apr	Fri	Trip [→Haneda 22:30,AA027]	-Conclude Field Report (Sign) with ODPEM											Trip [Kingston 11:55 → Miami 14:48, AA1545] Trip [Miami 18:10 → Dallas 20:28, AA207]				Kingston Dallas
59	16-Apr	Sat		-Making 2nd Field Survey Result Summary	Trip [Kingston 8:00 → Miami 10:54, AA2370] Trip [Miami 14:02 → Los Angels 16:43, AA287] Trip [Los Angels18:40 →]	-Making 2nd Field Survey Result Summary	-Geological Survey	-Making 2nd Field Survey Result Summary		-Making 2nd Field Survey Result Summary			-Making 2nd Field Survey Result Summary	Trip [Dallas 10:45 →]		-Geological Survey		Kingston
60	17-Apr	Sun		-Making 2nd Field Survey Result Summary	Trip [→Haneda 22:30,AA027]	-Making 2nd Field Survey Result Summary				-Making 2nd Field Survey Result Summary			-Making 2nd Field Survey Result Summary	Trip [→ Narita 14:00, AA175]			Kingston
61	18-Apr	Mon		-Making 2nd Field Survey Result Summary		-Making 2nd Field Survey Result Summary	-Geological Survey	-Making 2nd Field Survey Result Summary		-Making 2nd Field Survey Result Summary			-Making 2nd Field Survey Result Summary			-Geological Survey		Kingston
62	19-Apr	Tue																	Kingston
63	20-Apr	Wed																	Kingston
64	21-Apr	Thu					-Making 2nd Field Survey Result Summary									- Making Report			Kingston
65	22-Apr	Fri		Trip [Kingston 12:45 → Toronto 18:00, AC1803] Trip [Toronto 20:15 → Vancouver 22:10, AC033]		Trip [Kingston 11:55 → Miami 14:48, AA1545] Trip [Miami 17:35 → Dallas 20:28, AA207]	Trip [Kingston 12:45 → Toronto 18:00, AC1803]	Trip [Kingston 11:55 → Miami 14:48, AA1545] Trip [Miami 17:35 → Dallas 20:28, AA207]		Trip [Kingston 11:55 → Miami 14:48, AA1545] Trip [Miami 17:35 → Dallas 20:28, AA207]							Kingston
66	23-Apr	Sat		Trip [Vancouver 14:15 →]		Trip [Dallas 10:45 →]	Trip [Toronto 13:40 →]	Trip [Dallas 10:45 →]		Trip [Dallas 10:45 →]			Trip [Kingston 11:55 → Miami 14:48, AA1545] Trip [Miami 18:10 → Dallas 20:29, AA207]						Kingston
67	24-Apr	Sun		Trip [→ Narita 16:30, JL017]		Trip [→ Narita 14:00, AA175]	Trip [→ Haneda 15:35, AC005]	Trip [→ Narita 14:00, AA175]		Trip [→ Narita 14:00, AA175]			Trip [Dallas 10:40 →]						Kingston
68	25-Apr	Mon											Trip [→ Narita 14:00, AA175]			- Making Report			
69	26-Apr	Tue																	
70	27-Apr	Wed																	
71	28-Apr	Thu																	
72	29-Apr	Fri																	
73	30-Apr	Sat																	
74	1-May	Sun																	
75	2-May	Mon														- Making Report			
76	3-May	Tue																	

3rd Field Survey

No.	Date		Survey Content				Stay at
			JICA Masayuki FURUKAWA	YEC Tatsuya KOBAYASHI	YEC Kiyofusa TANAKA	YEC Masato TAMURA	
Person in Charge			Leader /Cooperation Planning	Chief Consultant /Operating& Maintenance Planning 1	Sub Chief Consultant /Operating& Maintenance Planning 2	Disaster Observation Planning1 (Radio)	
1	2016-08-29	Mon		Trip [Narita 18:20 - Vancouver 11:35-1, JL018] Trip [Vancouver 14:30 - Toronto 21:55, AC1108]			Toronto
2	2016-08-30	Tue	Trip [Narita 10:40 - Dallas 08:15, AA176] Trip [Dallas 12:25 - Miami 16:20, AA206] Trip [Miami 18:10 - Kingston 18:57, AA1082]	Trip [Toronto12:10 - Kingston15:10, AC1802]	Trip [Haneda 01:00 - Los Angeles 19:00-1, AA026] Trip [Los Angeles 23:55 - Miami 08:06, AA1538] Trip [Miami 10:04 - Kingston 10:57, AA1589] - Preliminary meeting with ODPEM		Kingston
3	2016-08-31	Wed	- Meeting at JICA Jamaica Office - Discussion with ODPEM and the related organizations for Draft Final Report, Draft of Minutes of Discussions (M/D), etc.			- Site survey at Paradise Station	Kingston
4	2016-09-01	Thu	- Site survey at Oracabessa and Shotover Stations				Kingston
5	2016-09-02	Fri	- Discussion with ODPEM for Draft Final Report, M/D, the Specifications of the Equipment, etc.				Kingston
6	2016-09-03	Sat	- Team Meeting - Updating Survey Data Sheet				Kingston
7	2016-09-04	San	- Team Meeting - Updating Survey Data Sheet				Kingston
8	2016-09-05	Mon	- Discussion with ODPEM and the related organizations for the Specifications of the Equipment, Project Implementation Structure, Operation and Maintenance Plan, etc.				Kingston
9	2016-09-06	Tue	- Courtesy call to Ministry of Local Government & Community Development (MLGCD) - Discussion with ODPEM and the related organizations for the undertakings by the Jamaican side, etc. - Report to Embassy of Japan		Trip [Kingston 07:30 - Miami 10:26, AA2370] Trip [Miami 12:45 - Los Angeles 15:23, AA139] Trip [Los Angeles 18:55, AA027]		Kingston On Flight
10	2016-09-07	Wed	Trip [Kingston 07:30 - Miami 10:26, AA2370] Trip [Miami 12:45 - Los Angeles 15:23, AA139] Trip [Los Angeles 18:55, AA027]	- Meeting with ODPEM for the implementation schedule, Operation and Maintenance Plan, etc.	Trip [- Haneda 22:30, AA027]		Kingston On Flight
11	2016-09-08	Thu	Trip [- Haneda 22:30, AA027]	Trip [Kingston 16:25 - Toronto 21:35, AC1803] Trip [Toronto - 22:55 - Vancouver 01:00+1, AC151]			Vancouver
12	2016-09-09	Fri		Trip [Vancouver 14:15 -, JL017]			On Flight
13	2016-09-10	Sat		Trip [- Narita16:30]			Narita

A3. List of Parties Concerned in the Recipient Country

3. List of Parties Concerned in the Recipient Country

Name of Organization	Position
Ministry of Finance and the Public Service (MOFPS)	
Mark Redwood	Director Programme Management
Alicia Forrest	Programme Management Officer
Ministry of Local Government & Community Development	
Hon. Desmond McKenzie	Minister
Mr. Denzil Thorpe	Permanent Secretary
Marsha Henry-Martin	Director of Urban & Development Planning
Planning Institute of Jamaica (PIOJ)	
Banbane Scott	Deputy Director General
Jhennell Todd	Project Economist
Office of Disaster Preparedness & Emergency Management (ODPEM)	
Joy Douglas	Chairman
Major Clive Davis	Director General
Richard Thompson	Deputy Director General
Horace Glaze	Senior Director Preparedness
Pauline Brown	Senior Director Projects
Andrea McLean	Senior Director Corporate Services
Delmares White	Director Information & Training
Cheryl Nichols	Director Information & Training
Beverley Thompson	Director Human Resource Management
Yvonne Bernard	Director of Finance
Allison Gordon	Regional Coordinator (Northern)
Roland Haye	Regional Coordinator (Western)
Camille Beckford	Regional Disaster Coordinator (Southern Region)
Ruel Corniffe	Senior Telecommunications Engineer
Sashanya Grayson	Senior Secretary
Derona Henry	Secretary
Michelle Edwards	SD MPRD
Stephanie McFarlane	Project Manager
Orlene Garvey	Information Officer
Orphia Grey	Temporary Audio Visual Technician
Cush Sewell Lewis	Monitoring and Evaluation Officer
Christopher Gayle	Research Analyst
Carolyn Nelson	Assistant Telecomm Officer
Michka-may Small	Intern
Yoshiaki Nishimura	JICA Regional Expert

Micheal Forrester	Telecommunications Administrative Coordinator
Denise Lewis	Officer

National Work Agency (NWA)

Krystal Lyn	Edu Engineer
Dane Lawrence	Signal Technician
Michael Saunderson	Operation Manager
Karen Arscott	Assistant Manager
Oslan Simpson	Corporate Planner

Meteorological Service (METS)

Evan Thompson	Head of Weather Branch
Jacqueline Spence	Head of Climate Branch
Mark Cunningham	Instrument Specialist
Lawrence Brown	Senior Meteorologist
Adrian Shaw	Senior Meteorologist
Jerome Crooks	Instrument Engineer
Harville Harrison	Instrument Engineer
Bordwill Irving	Head of Radar Section

Water Resource Authority (WRA)

Basil Fernandez	Managing Director
Michael R. A. Wilson	Senior Hydrologist
Alexcia Gray	Hydrologist
Herbert Thomas	Deputy Managing Director

Jamaica Fire Brigade (JFB)

Wilfred Flanner	OIC Communication

Jamaica Public Service (JPS)

Dannielle Watson-Banks	Director
Ludlow Thompson	IT Specialist
Leon Martin	Network Specialist
Robert Shaw	Manager
Alan Vickers	Officer
Garfield Simpson	Officer

Port Authority

Gimen Mendes	Port Captain

Earthquake Unit, University of West Indies (UWI)

Simon Mitchell	Head
Paul Williams	Network Manager Engineer
Karleen Black	Scientific Officer
Raymond Stewart	Senior Analyst

Broadcasting Commission

Cordel Green	Executive Director
Tasra Mathson	Assistant Executive Director
Donovan Campbell	Technical Officer
Nicole Wayord	Legal Officer
Jodi Ann Jackson	Economist

Spectrum Management Authority (SMA)

Peter Scott	Manager, Band Planning
Kwan Wilson	Manager, Monitoring & Inspection
Mahlangu Lawson	Officer

Kingston and St. Andrew Parish Council

David Ellis	Disaster Preparedness Coordinator

St. Thomas Parish Council

Kanelia Esson	Disaster Preparedness Coordinator
Martina Medley	Disaster Preparedness Coordinator

St. Catherine Parish Council

Patricia Lewis	Disaster Preparedness Coordinator
Orville Lee	Disaster Preparedness Coordinator
Teshina Thompson	Disaster Preparedness Coordinator

St. Mary Parish Council

Denzil Roper	Deputy Superintendent
Glenford Ricketts	Disaster Preparedness Coordinator
Yolanda Jankie	Disaster Preparedness Coordinator

Portland Parish Council

Fay Neufville	Secretary Manager
Nicole Smith	Disaster Preparedness Coordinator
Rhona Blake	Disaster Preparedness Coordinator

Manchester Parish Council

La-Jean Powell-Richards	Disaster Preparedness Coordinator

St.Elizabeth Parish Council

Claudine Forbes	Disaster Preparedness Coordinator

Clarendon Parish Council

Eleanor Coombs	Disaster Preparedness Coordinator

St.James Parish Council

Tamoy Sinclair	Disaster Preparedness Coordinator

Hanouver Parish Council

Keneisha Stennett-Dunbar	Disaster Preparedness Coordinator

Westmoreland Parish Council

Hilma Tate	Disaster Preparedness Coordinator

St.Ann Parish Council

Alvin Clarke	Disaster Preparedness Coordinator

TrelawnyParish Council

Dion Hylton-Lewis	Disaster Preparedness Coordinator

Digicel

Vince Plummer	Facilities Manager
Locksley Anderson	Security Manager
Byron Reynolds	Radio Programmer

Aerotel

Rowell Hall	Regional Operations Manager
David Miller	Officer

The Jamaica Constabulary Force (JCF)

Leonardo Brown	Senior Superintendent of Police
Noel Ellis	Officer in charge of Communication

Jamaican Defense Force (JDF)

Major Sheldon Bryan	Communication & Information System Officer

Suncity Radio

Steve Billings	Chairman

HOT 102 Radio Station

Ray Alexander	Marketing Manager

CVM TV Station

Patria-Kaye Aarons	Chief Executive Officer

Telecom Consultant

Antonio Peterkin	Consultant
Amo Wilson	Assistant

UNDP Jamaica Office

Richard Kelly	Programme Specialist
Novia McKay	Programme Associate

Japan Overseas Cooperation Volunteers

Kyoka Satoh	JICA Volunteer
Shingo Oba	JICA Volunteer

Embassy of Japan in Jamaica

Masanori Nakano	Ambassador Extraordinary and Plenipotentiary
Hideki Shinozaki	Second Secretary

JICA Jamaica Office

Kenji Tobita	Resident Representative
Lorna Wallace	Senior Programme Office

A4. Minutes of Discussions

Minutes of Discussions
on the Preparatory Survey for the Project for
Improvement of Emergency Communication System

In response to the request from the Government of Jamaica , the Government of Japan decided to conduct a Preparatory Survey for the Project for Improvement of Emergency Communication System (hereinafter referred to as "the Project"), and entrusted the Preparatory Survey to Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent the Preparatory Survey Team for the Outline Design (hereinafter referred to as "the Team") to Jamaica, headed by Mr. Jitsuya ISHIGURO, Advisor, Team 1, Transportation and ICT Group, Infrastructure and Peacebuilding Department, JICA and is scheduled to stay in the country from 13th July to 27th July, 2015.

The Team held a series of discussions with the officials representing the Government of Jamaica and conducted a field survey in the Project area. In the course of the discussions, both sides confirmed the main items described in the attached sheets. The Team will proceed to further works and prepare the Preparatory Survey Report.

Kingston, Jamaica, 16th July, 2015

Jitsuya ISHIGURO	Major Clive Davis
Leader	Director General
Preparatory Survey Team	Office of Disaster Preparedness and Emergency Management
Japan International Cooperation Agency	Ministry of Local Government and Community Development
Japan	Jamaica

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve emergency communication infrastructure in Jamaica by installing wireless communication system and relevant equipment, thereby contributing to swift and robust communication between Government offices and Jamaican people to respond to disaster emergencies.

2. Title of the Preparatory Survey

Both sides confirmed the title of the Preparatory Survey as "the Preparatory Survey for the Project for Improvement of Emergency Communication System".

3. Project Area

Both sides confirmed that the Project covers all or most of Jamaica as shown in Annex 1.

4. Line Ministry and Executing Agency

Both sides confirmed the line Ministry and executing agency as follows:

4-1. The line ministry is the Ministry of Local Government and Community Development, which is the ministry to supervise the executing agency.

4-2. The executing agency is the Office of Disaster Preparedness and Emergency Management (hereinafter referred to as "ODPEM") . The executing agency shall coordinate with all the relevant agencies to ensure smooth implementation of the Project and ensure that the Undertakings are taken by relevant agencies properly and on time. The organization charts are shown in Annex 2.

5. Items requested by the Government of Jamaica

5-1. As a result of discussions, both sides confirmed that the items requested by the Government of Jamaica are as follows:

(1) A national Disaster-Emergency Communication System (DECOM)

The DECOM is consist of following features;

- A new comprehensive digital wireless network integrated with existing analog wireless network;
- Communication network between parishes and communities;
- Emergency mobile communication units for vulnerable communities;
- A connection with IP-Core back born network.

The DECOM consists of following major items;

- Digital-Analog radio repeater network stations;
- Mobile communication tools ("Community Pack");
- Integrated command and control stations;
- Training materials.

(2) Early Warning System (EWANS) which is using Alert FM solution.

5-2. JICA will assess the appropriateness of the above requested items through the survey and will report findings to the Government of Japan. The final components of the Project would be decided by the Government of Japan.

6. Japanese Grant Scheme

6-1. The Jamaican side understands the Japanese Grant Scheme and its procedures as described in Annex 3 and Annex 4, and necessary measures to be taken by the Government of Jamaica.

6-2. The Jamaican side understands to take the necessary measures, as described in Annex 6, for smooth implementation of the Project, as a condition for the Japanese Grant to be implemented. The detailed contents of the Annex 6 will be worked out during the survey and shall be agreed no later than the Explanation of the Draft Preparatory Survey Report which is planned in April, 2016.

The contents of Annex 6 will be updated as the Preparatory Survey progresses.

7. Schedule of the Survey

7-1. The Team will proceed with the first survey in Jamaica until 27th July,2015

7-2. JICA will prepare an interim report including the results of the first survey and JICA will send a mission team to explain its contents to the Jamaican side in early October 2015 (2nd field survey). And the Team will continuously conduct the 2nd field survey for outline design and cost estimation until end of October, 2015.

7-3. JICA will prepare a draft Preparatory Survey Report in English and dispatch a mission to Jamaica in order to explain its contents around April, 2016.

7-4. If the contents of the draft Preparatory Survey Report is accepted in principle and the Undertakings are fully agreed by the Jamaica side, JICA will complete the final report in English and send it to Jamaica around June, 2016.

7-5. The above schedule is tentative and subject to change.

8. Other Relevant Issues

8-1. The Jamaican side shall, at its own expenses, provide the Team with the following items in cooperation with organizations concerned.

(1) Security-related information as well as measures to ensure the safety of the Team members;
(2) Information as well as support in obtaining medical service;
(3) Data and information related to the Preparatory Survey;
(4) Counterpart personnel;
(5) Suitable office space with necessary equipment and services;
(6) Credentials or identification cards;
(7) Entry permits necessary for the survey team members to conduct field surveys; and
(8) Support in obtaining other privileges and benefits if necessary.

8-2. Questionnaire

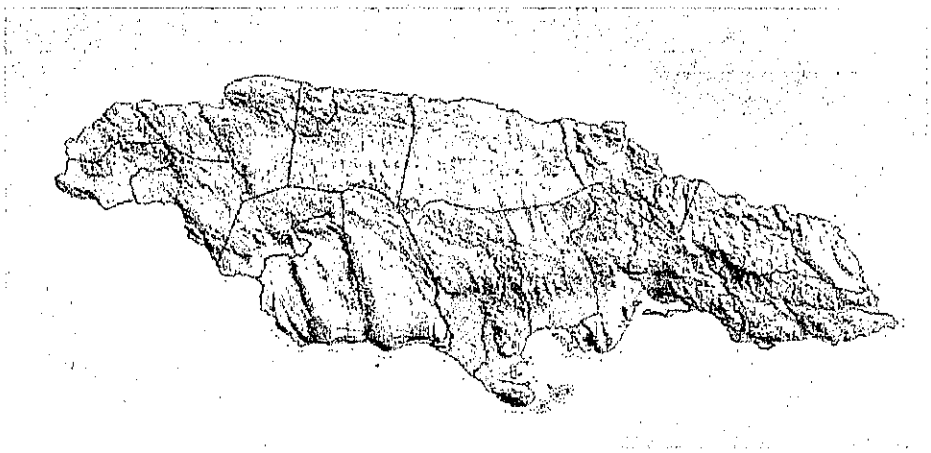
ODPEM shall answer to the Questionnaire submitted by the Team in English with relevant documents by 22nd July, 2015.

Annex 1 Project Site
Annex 2 Organization Chart
Annex 3 Japanese Grant
Annex 4 Flow Chart of Japanese Grant Procedures
Annex 5 Financial Flow of Japanese Grant
Annex 6 Major Undertakings to be taken by Each Government
Annex 7 Project Monitoring Report (template)

Annex 1

Project Site

Location of Jamaica in Central and South America

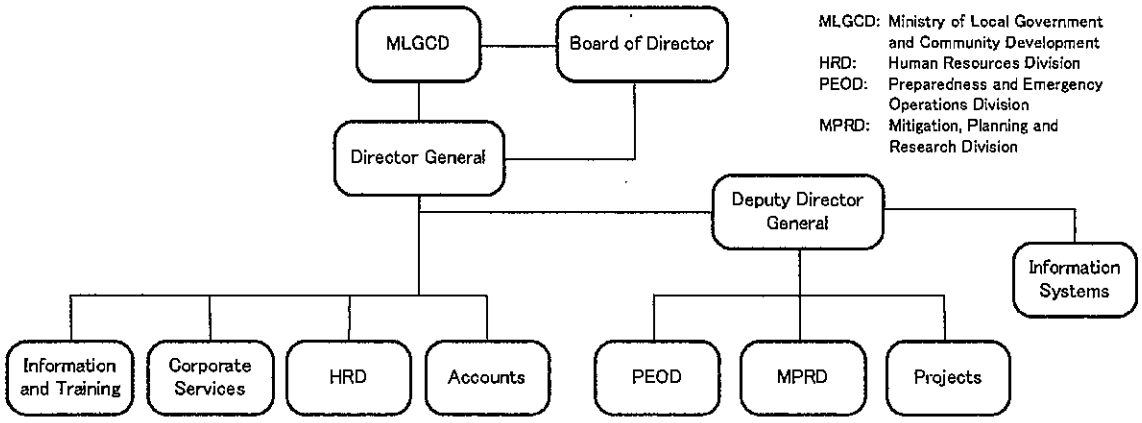


All Jamaica

Annex 2

Organization Chart

Office of Disaster Preparedness and Emergency Management (ODPEM)



Annex 3

Japanese Grant

Based on the JICA law which was entered into effect on October 1, 2008 and the decision of the GOJ, JICA is the executing agency of the Japanese Grant for Projects for construction of facilities, purchase of equipment, etc.

The Japanese Grant (hereinafter referred to as the "Grant") is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant is not supplied through the donation of materials as such.

1. Grant Procedures

The Grant is supplied through following procedures :

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal &Approval
  - -Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - -The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - -Agreement concluded between JICA and a recipient country
- Implementation
  - -Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.

- Evaluation of the appropriateness of the Project to be implemented under the Grant Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of a outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant project. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. JICA expects that such measures should be ascertained even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japanese Grant Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the

recipient country to define the necessary articles, in accordance with the E/N, to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. The Grant may be used for the purchase of the products or services of a third country, if necessary, taking into account the quality, competitiveness and economic rationality of products and services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals", in principle.

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals, in principle. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Project, the recipient country is required to undertake such necessary measures as Annex 6.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant.

(7) "Export and Re-export"

The products purchased under the Grant should not be exported or re-exported from

the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"), in principle. JICA will execute the Grant by making payments in Japanese yen, in principle, to cover the obligations incurred by the Government of the recipient country or its designated authority under the verified contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations

The Government of the recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and "JICA Guidelies for Environmental and Social Considerations (April 2010)."

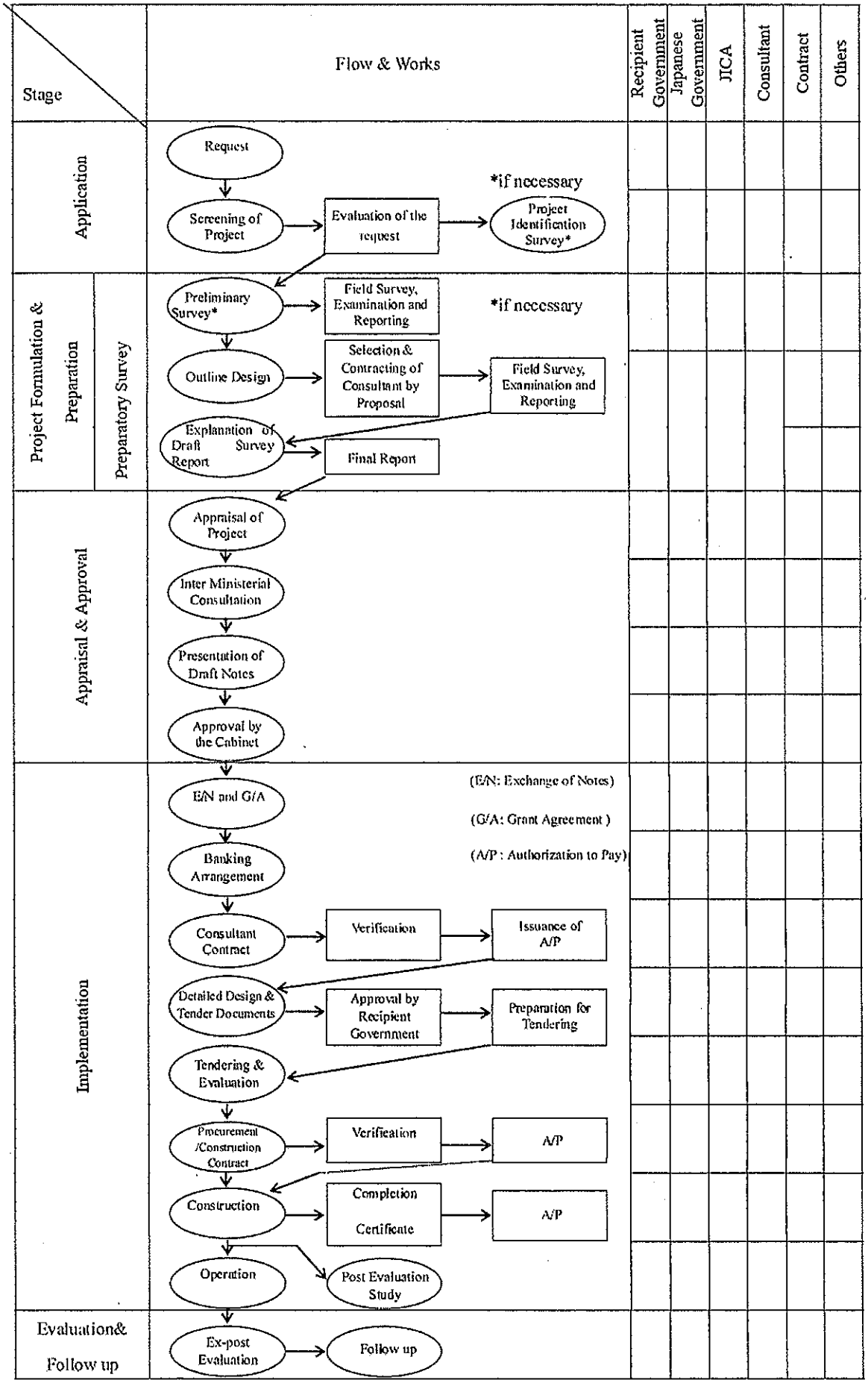
(11) Monitoring

The Government of the recipient country must take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and must regularly report to JICA about its status by using the Project Monitoring Report (PMR).

(12) Safety Measures

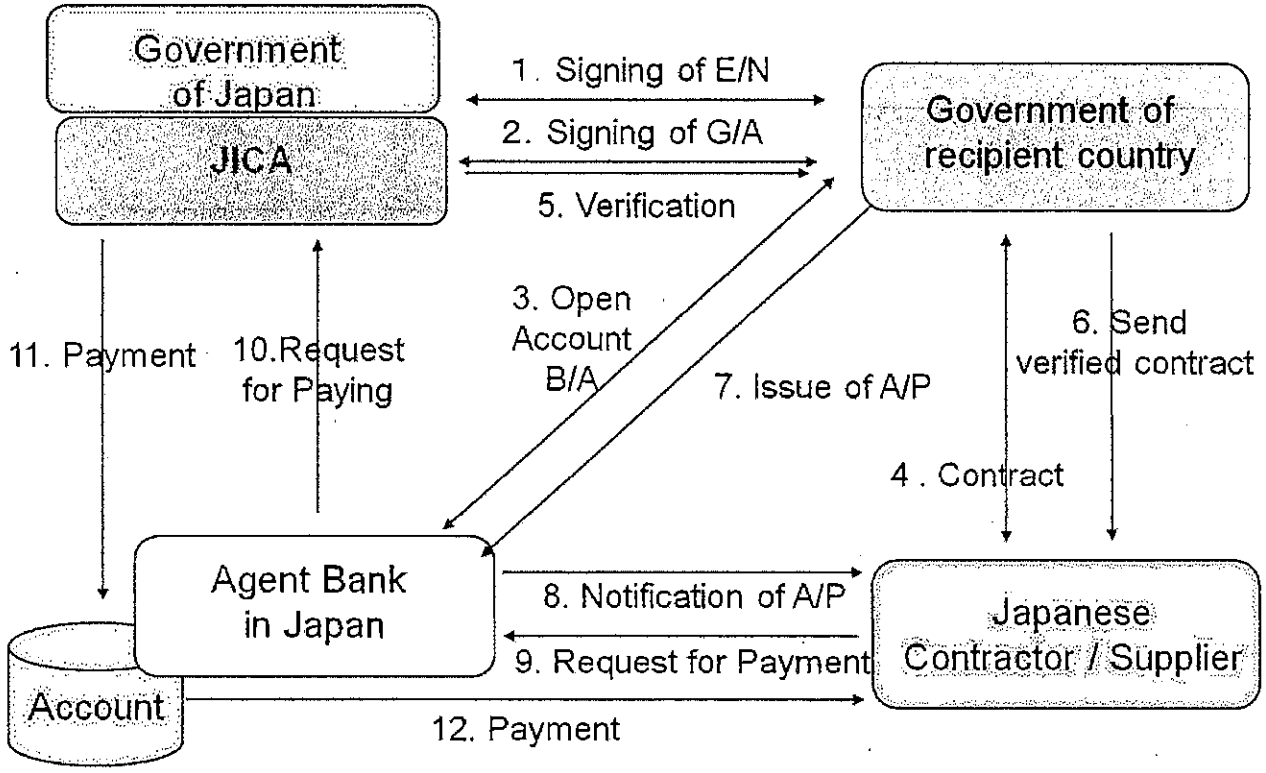
The Government of the recipient country must ensure that the safety is highly observed during the implementation of the Project.

Flow Chart of Japanese Grant Procedures



Annex 5

Financial Flow of Japanese Grant



(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

Annex 6

Major Undertakings to be taken by Each Government as a condition for the Japan Grant Aid to be implemented

No.	Items	To be covered by		Remarks
		Grant Aid	Recipient Side	
1	To confirm land registration and its property, and permission for the implementation of the Project and to clear the site		●	
2	To bear the following commissions paid to the Japanese bank for banking services based upon the Banking Arrangement (B/A)		●	
	1) Advising commission of Authorization to pay (A/P)		●	
	2) Payment commission		●	
3	To ensure prompt unloading and customs clearance at the port(s) of disembarkation, and internal transportation in the recipient country			
	1) Marine or Air transportation of the components from Japan and/or third countries to the recipient country	●		
	2) Tax exemption and customs clearance of the equipment and components at the port(s) of disembarkation in the recipient country		●	
	3) Internal transportation of the equipment and components from the port(s) of disembarkation to the project site in the recipient country	●		
4	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted/be borne by the Authority without using the Grant		●	
5	To accord Japanese physical persons and / or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●	
6	To maintain and use properly and effectively the facilities constructed and the equipment provided under the Grant Aid		●	
7	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●	
8	To give due environmental and social consideration in the implementation of the Project		●	

●: denote the side responsible for the work

Major Undertakings to be taken by Each Government after an approval of Project implementation

No.	Items	To be covered by		Remarks
		Grant Aid	Recipient Side	
1	To secure sites for material storing yard, temporary construction yard and waste disposal		●	
2	To arrange issuance of license, permission and other necessary procedures for the Project		●	
3	To secure enough budget and personnel necessary for the operation and maintenance of the facilities implemented under the Grant Aid, including the periodical maintenance work after the completion of the Project		●	

●: denote the side responsible for the work

Project Monitoring Report
on
Project Name
Grant Agreement No. XXXXXXX

20XX, Month

Organization Information

Authority (Signer of the G/A)	Person in Charge _____ (Division) _____ Contacts Address: _____ Phone/FAX: _____ Email: _____
Executing Agency	Person in Charge _____ (Division) _____ Contacts Address: _____ Phone/FAX: _____ Email: _____
Line Ministry	Person in Charge _____ (Division) _____ Contacts Address: _____ Phone/FAX: _____ Email: _____

Outline of Grant Agreement:

Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____
Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:

1: Project Description

1-1 Project Objective

1-2 Necessity and Priority of the Project

- Consistency with development policy, sector plan, national/regional development plans and demand of target group and the recipient country.

1-3 Effectiveness and the indicators

- Effectiveness by the Project

Quantitative Effect (Operation and Effect indicators)		
Indicators	Original (Yr)	Target (Yr)
Qualitative Effect		

2: Project Implementation

2-1 Project Scope

Table 2-1-1a: Comparison of Original and Actual Location

Location	**Original:** *(M/D)* **Attachment(s):Map**	**Actual:** *(PMRand PCR)* **Attachment(s):Map**

Table 2-1-1b: Comparison of Original and Actual Scope

Items	Original	Actual
(M/D)	*(M/D)*	*(PMR and PCR)* Please state not only th e most updated schedul e but also other past re visions chronologically.

'Soft component' shall be included in 'Items'.		All change of design shal l be recorded regardless of its degree.

2-1-2 Reason(s) for the modification if there have been any.

(PMR and PCR)

2-2 Implementation Schedule
2-2-1 Implementation Schedule

Table 2-2-1: Comparison of Original and Actual Schedule

Items	Original		Actual
	DOD	G/A	
[M/D]	*(M/D)*		*(PMR,PCR)* As of (Date of Revision)
'Soft component' shall be stated in the column of 'Items'.			Please state not only the most updated schedule but also other past revisions chronologically.
Project Completion Date*			

*Project Completion was defined as _____ at the time of G/A.

2-2-2 Reasons for any changes of the schedule, and their effects on the project.

(PMR and PCR)

2-3 Undertakings by each Government
2-3-1 Major Undertakings
See Attachment 2.

2-3-2 Activities
See Attachment 3.

2-3-3 Report on RD
See Attachment 4.

2-4 Project Cost
2-4-1 Project Cost
Table 2-3-1 Comparison of Original and Actual Cost by the Government of Japan
(Confidential until the Tender)

Items			Cost (Million Yen)	
	Original	Actual	Original	Actual
Construction Facilities (or Equipment)	'Soft component' shall be included in 'Items'.			Please state not only the most updated schedule but also other past revisions chronologically.
Consulting Services	- Detailed design -Procurement Management -Construction Supervision			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

Table 2-3-2 Comparison of Original and Actual Cost by the Government of XX

Items			Cost (Million USD)	
	Original	Actual	Original	Actual
	'Soft component' shall be included in 'Items'.			Please state not only the most updated schedule but also other past revisions chronologically.
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = (local currency)

2-4-2 Reason(s) for the wide gap between the original and actual, if there have been any, the remedies you have taken, and their results.

(PMR, PCR)

2-5 Organizations for Implementation

2-5-1 Executing Agency:

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original: *(M/D)*
Actual, if changed: *(PMR and PCR)*

2-6 Environmental and Social Impacts

Report based on the agreed environmental checklist and monitoring form (See Attachment 4)

3: Operation and Maintenance (O&M)

3-1 O&M and Management

- Organization chart of O&M
- Operational and maintenance system (structure and the number ,qualification and skill of staff or other conditions necessary to maintain the outputs and benefits of the project soundly, such as manuals, facilities and equipment for maintenance, and spare part stocks etc)

Original: *(M/D)*
Actual: *(PCR)*

3-2 O&M Cost and Budget

- The actual annual O&M cost for the duration of the project up to today, as well as the annual O&M budget.

Original: *(M/D)*

4: Precautions (Risk Management)

- Risks and issues, if any, which may affect the project implementation, outcome, sustainability and planned countermeasures to be adapted are below.

Original Issues and Countermeasure(s): *(M/D)*	
Potential Project Risks	Assessment
1.	Probability: H/M/L

(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
2.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
3.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
Actual issues and Countermeasure(s)	
(PMR and PCR)	

5: Evaluation at Project Completion and Monitoring Plan

5-1 Overall evaluation

Please describe your overall evaluation on Project.

(PCR)

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

(PCR)

5-3 Monitoring Plan for the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

(PCR)

Attachment

1. Project Location Map
2. Undertakings to be taken by each Government
3. Monthly Report
4. Report on RD
5. Monitoring report on environmental and social considerations
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (Completion Report Only)

(2) 2nd Field Survey

Minutes of Discussions
on the Preparatory Survey for the Project for
Improvement of Emergency Communication System

In response to the request from the Government of Jamaica, the Government of Japan decided to conduct a Preparatory Survey for the Project for Improvement of Emergency Communication System (hereinafter referred to as "the Project"), and entrusted the Preparatory Survey to Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent the Preparatory Survey Team (hereinafter referred to as "the Team") for the Outline Design to Jamaica, headed by Masayuki FURUKAWA, Deputy Director, Team1, Transportation and ICT Group, Infrastructure and Peacebuilding Department and is scheduled to stay in Jamaica from February 19, 2016 to April 21, 2016.

The Team participated in a series of discussions with the officials representing the Government of Jamaica and conducted a field survey as part the Project area. In the course of the discussions, both sides have agreed on the main items described in this document. The Team will continue to prepare the Preparatory Survey Report.

April 12, 2016
Kingston, Jamaica

Masayuki FURUKAWA
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Major Clive Davis
Director General
Office of Disaster Preparedness and Emergency Management
Ministry of Local Government and Community Development
Jamaica

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve emergency communication infrastructure in Jamaica by installing wireless communication system and relevant equipment, thereby contributing to swift and robust communication between Government offices and Jamaican people to respond in real time to disaster emergencies, thus minimizing and mitigating against loss of life and property.

2. Title of the Preparatory Survey

Jamaica and Japan confirmed the title of the Preparatory Survey to be "the Preparatory Survey for the Project for Improvement of Emergency Communication System".

3. Project Site

Both sides confirmed that the Project covers almost all of Jamaica as shown in Annex 1.

4. Government Agency and Executing Agency

Both sides confirmed the line agency and executing agency as follows:

4-1. The government agency is the Ministry of Local Government & Community Development, which is the ministry to supervise the executing agency's management of the project.

4-2. The executing agency is the Office of Disaster Preparedness and Emergency Management (hereinafter referred to as "ODPEM"). The executing agency shall coordinate with all the relevant agencies to ensure smooth implementation of the Project and ensure that the Undertakings/deliverables are performed by the relevant agencies efficiently and in a timely manner.

N.B: The organizational charts are shown in Annex 2.

5. Items requested by the Government of Jamaica

5-1. As a result of surveys, assessments and discussions, both sides confirmed that the items requested by the Government of Jamaica are as follows:

(1) A national Disaster-Emergency Communication System (hereinafter referred to as "DECOM")

The DECOM consists of following major items;

- Radio Repeater Station
- Two-Way Radio Terminal
- Integrated Command and Control Station
- Communication Support Equipment
- Video Monitoring System
- Maintenance Equipment

(2) Early Warning System (hereinafter referred to as "EWANS") which is using Siren System.

5-2. JICA will assess the appropriateness of the above requested items through the survey and will report findings to the Government of Japan. The final components of the Project would be decided by the Government of Japan.

6. Japanese Grant Scheme

6-1. The Jamaica side understands the Japanese Grant Scheme and its procedures as described in Annex 3 and Annex 4, and necessary measures to be taken by the Government of Jamaica.

6-2. The Jamaica side understands to take the necessary measures, as described in Annex 6, for the smooth implementation of the Project components, as a condition for the Japanese Grant to be implemented. The detailed contents of the Annex 6 will be determined during the survey and shall be agreed no later than by the Explanation of the Draft Preparatory Survey Report.
Contents of Annex 6 will be updated as the Preparatory Survey progresses, and will finally be an appendage to the Grant Agreement.

7. Schedule of the Survey

7-1. The Team had conducted the first survey in Jamaica from July 13, 2015 until July 27, 2015.

7-2. The Team will proceed with further survey in Jamaica until April 21, 2016.

7-3. JICA will prepare a draft Preparatory Survey Report in English and dispatch a mission to Jamaica in order to explain its contents around early July, 2016.

7-3. If the contents of the draft Preparatory Survey Report is accepted in principle and the Undertakings are fully agreed by the Jamaica side, JICA will complete the final report in English and send it to Jamaica around September, 2016.

N.B: The above schedule is tentative and subject to change.

8. Proper Use

The Jamaica side confirmed the items requested will be used only for the objective of the Project and not to be used for other purposes; for example, military operations.

9. Other Relevant Issues

The Jamaica side shall, at its own expenses, provide the Team with the following items in cooperation with organizations concerned.

(1) Security-related information as well as measures to ensure the safety of the Team members;
(2) Information as well as support in obtaining medical service;
(3) Data and information related to the Preparatory Survey;
(4) Counterpart personnel;
(5) Suitable office space with necessary equipment and services;
(6) Credentials or identification cards;
(7) Entry permits necessary for the survey team members to conduct field surveys; and
(8) Support in obtaining other privileges and benefits if necessary.

Annex 1 Project Site
Annex 2 Organization Chart
Annex 3 Japanese Grant
Annex 4 Flow Chart of Japanese Grant Procedures
Annex 5 Financial Flow of Japanese Grant
Annex 6 Major Undertakings to be taken by Each Government
Annex 7 Tax Exemption Procedures
Annex 8 Plan for Transportation of the Equipment

Project Site

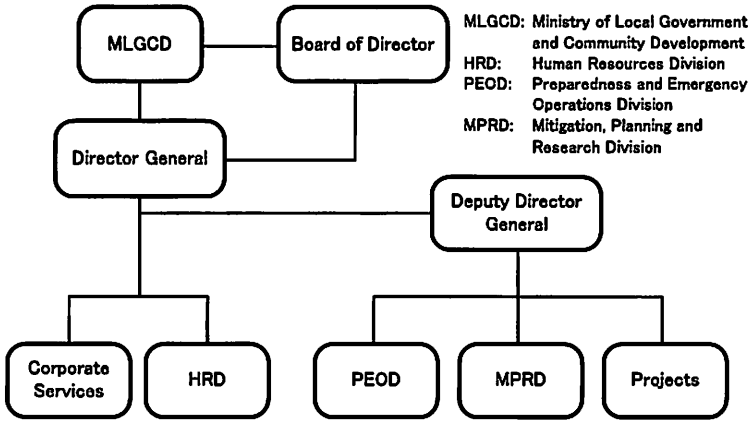
Location of Jamaica in Central and South America

All Jamaica

Annex 2

Organization Chart

Office of Disaster Preparedness and Emergency Management (ODPEM)



Japanese Grant

Based on the JICA law which was entered into effect on October 1, 2008 and the decision of the Government of Japan, JICA is the executing agency of the Japanese Grant for Projects for construction of facilities, purchase of equipment, etc.

The Japanese Grant (hereinafter referred to as the "Grant") is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant will not be described as a donation of materials, but as a fund for specific purpose as described in the objective.

1. Grant Procedures

The Grant is supplied through following procedures :

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal &Approval
  - -Appraisal by the Government of Japan and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - -The Notes exchanged between the Government of Japan and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - -Agreement concluded between JICA and a recipient country
- Implementation
  - -Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the Government of Japan and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of a outline design of the Project.
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The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant project. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant scheme.

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(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the Government of Japan to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japanese Grant Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the Government of

Japan and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles, in accordance with the E/N, to implement the Project, to implement the Project, such as payment procedures, responsibilities of the Government of the recipient country, and procurement policies.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. The Grant may be used for the purchase of the products or services of a third country, if necessary, taking into account the quality, competitiveness and economic rationality of products and services necessary for achieving the objective of the Project. However, the prime contractors, in relation to construction and procurement are limited to Japanese nationals. Additionally, in principle, the composition of the prime consulting firm is also limited to Japanese nationals.

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals, in principle. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Project, the recipient country is required to undertake such necessary measures as Annex 6.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant.

(7) "Export and Re-export"

The products purchased under the Grant should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"), in principle. JICA will execute the Grant by making payments in Japanese yen, in principle, to cover the obligations incurred by the Government of the recipient country or its designated authority under the verified contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations

The Government of the recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and "JICA Guidelies for Environmental and Social Considerations (April 2010)."

(11) Monitoring

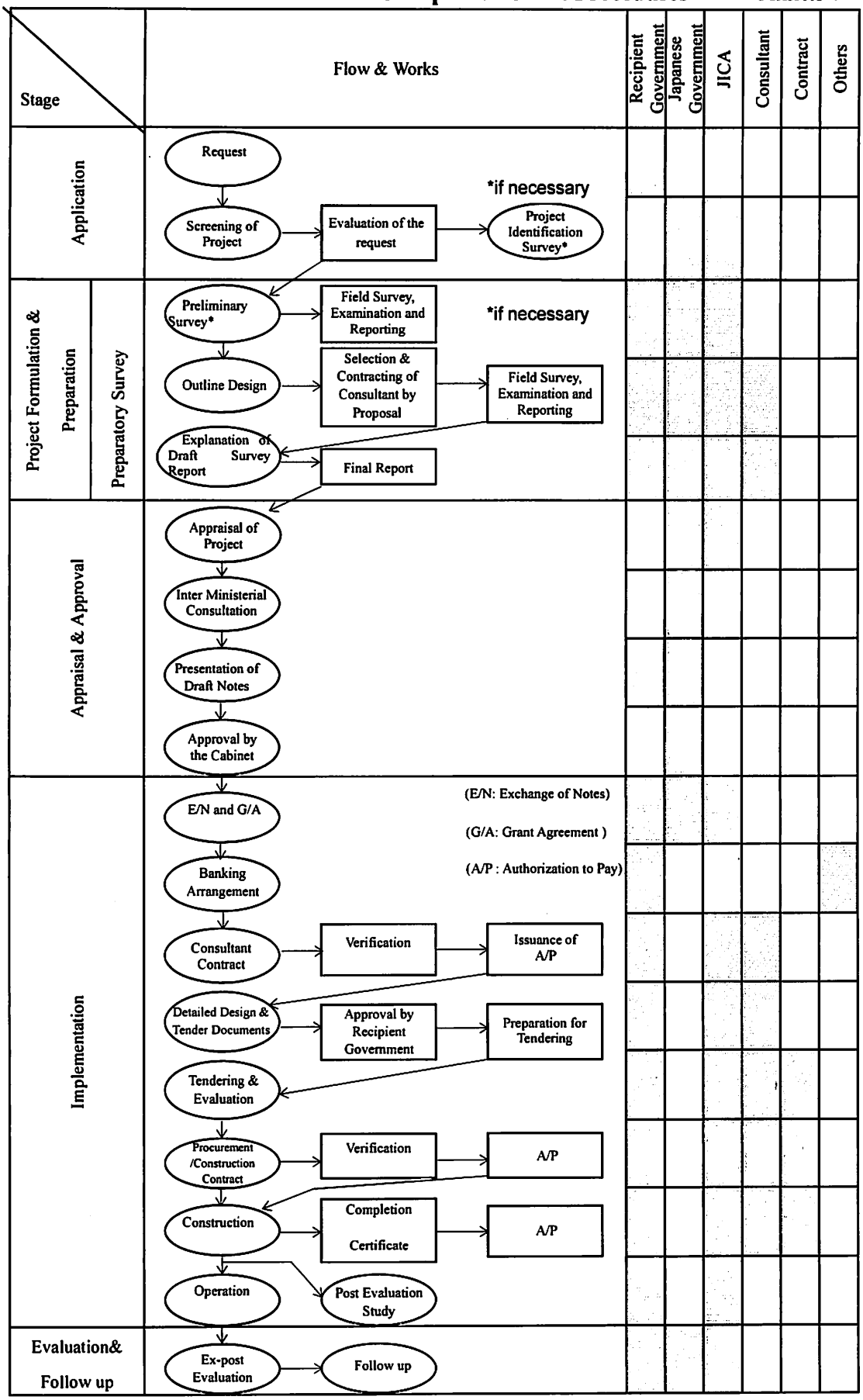
The Government of the recipient country must take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and must regularly report to JICA about its status by using the Project Monitoring Report (PMR).

(12) Safety Measures

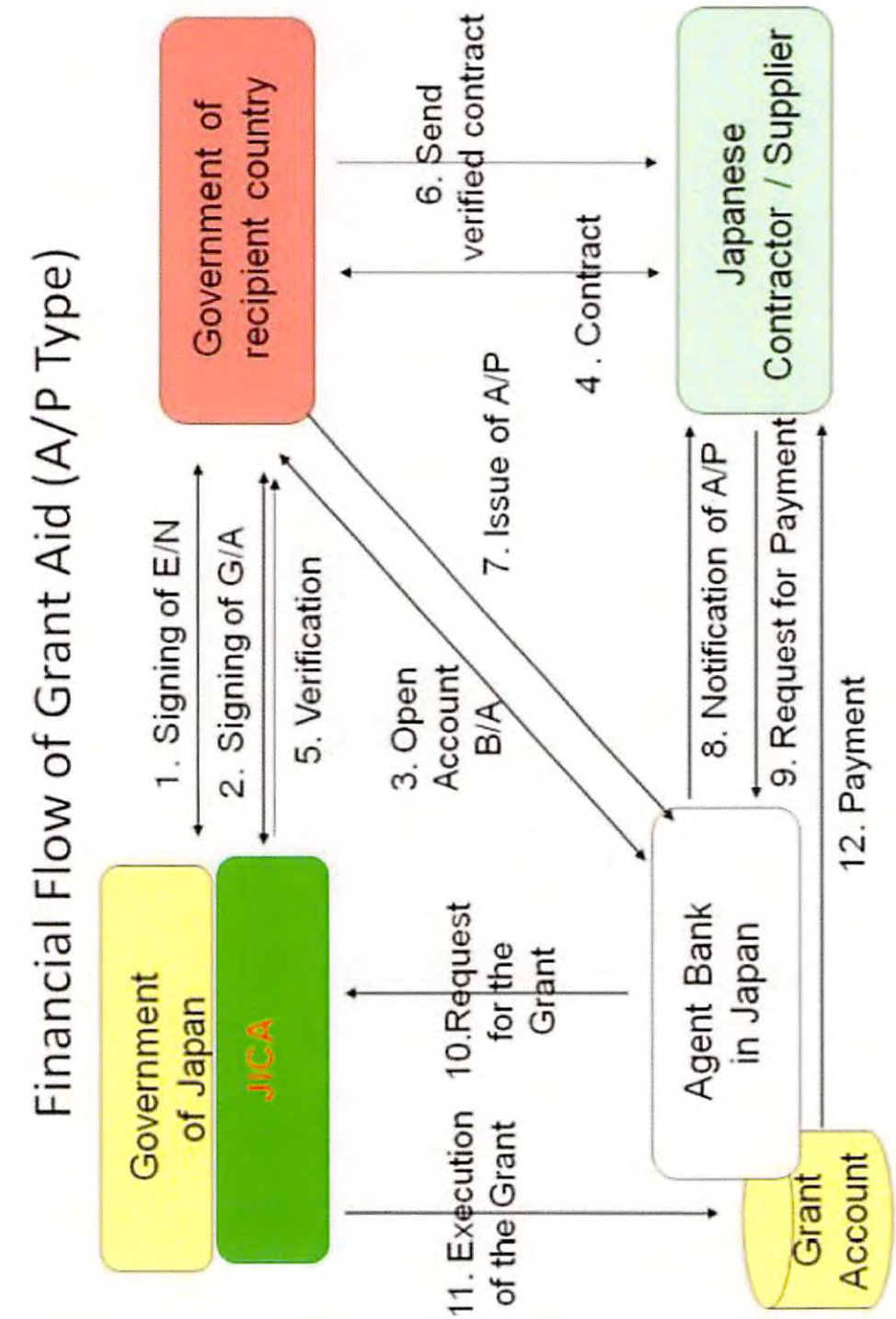
The Government of the recipient country must ensure that the safety is highly observed during the implementation of the Project.

Flow Chart of Japanese Grant Procedures

Annex 4



Financial Flow of Japanese Grant



(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

Annex 6

Major Undertakings to be taken by Recipient Government

1. Before the Tender

NO	Items	Deadline	In charge	Cost	Ref.
1	To secure the capacity of NWA's IP Core Backbone Network for DECOM	before DFR	ODPEM	0	
2	To secure the following lands 1) Project sites for Radio Repeater Stations 2) Project sites for installation of equipment	before DFR	ODPEM	TBA	
3	To give due environmental and social consideration in the implementation of the Project, if necessary	before DFR	To be confirmed	0	
4	To obtain the confirmation letter for 1) Acquiring permission to use lands for installation of the Equipment 2) New frequencies for the Microwave Link and new UHF frequencies for the Radio Repeater Stations including necessary arrangement for allocation of those frequencies 3) Arrangement of issuance of license and other necessary procedures for the Project, if necessary	before DFR	ODPEM	TBA	
5	To open Bank Account (Banking Arrangement (B/A))	within 1 month after G/A	MOFP	0	
6	To establish the Maintenance Center	before notice of the Tender Documents	ODPEM	TBA	

DFR: Draft Final Report, TBA: To be Advised

2. During the Project Implementation

NO	Items	Deadline	In charge	Cost	Ref.
1	To bear the following commissions to a bank of Japan for the banking services based upon the B/A				
	1) Advising commission of A/P	within 1 month after the singing of the contract	ODPEM	TBA	Around 5,000 (JPY) / time
	2) Payment commission for A/P	every payment	ODPEM	TBA	0.1% of payment amount
2	To ensure that custom duties and internal taxes which may be imposed in the country of the Recipient with respect to the purchase of the Products and/or the Services be exempted, such as, 1) Import Duties, 2) General Consumption Tax	during the Project	ODPEM	0	Annex7
3	To ensure that other custom duties and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the Products and/or the Services be borne by its designated authority without using the Grant, such as, 1) Customs administration Fee (CAF) 2) Other fiscal levies: Standard Compliance Fee, Environmental Levy	during the Project	ODPEM	TBA	
4	To bear all the expenses, other than those to be borne by the Grant Aid	during the Project	ODPEM	-	
5	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country				
	1) Tax exemption and customs clearance of the products at the port of disembarkation	during the Project	ODPEM	0	

NO	Items	Deadline	In charge	Cost	Ref.
	2) Internal transportation from the stations to the Project sites a. to transport the vehicles to the workshop to install Mobile Radio Station b. to distribute the vehicles installed Mobile Radio Station to the public organizations c. to distribute the Handheld Radio Set, Community Operation Station, Operation Station for Cay and Communication Support Equipment to each location	during the Project	ODPEM	TBA	Annex8
6	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work	during the Project	ODPEM	TBA	
7	To assure the security for personnel in the Project sites, when necessary	during the Project	ODPEM	TBA	
8	To ensure the required power supplies 1) for the new repeater huts 2) for the equipment to be installed in the existing building	before commencement of the Installation Work	ODPEM	TBA	
9	To rehabilitate the existing repeater huts	before commencement of the Installation Work	ODPEM	TBA	
10	To clear and remove obstacles in the Project sites	before commencement of the Installation Work	ODPEM	TBA	
11	To construct access roads to the Project sites, if necessary	during the Project	ODPEM	TBA	
12	To secure the following storages, facilities, sites, yard, etc.; 1) Storages for the Equipment in Kingston and Montego Bay 2) Temporary offices for the Consultant and the Supplier 3) Sites for material storing yard 4) Temporary construction yard 5) Waste disposal around the Project sites	during the Project	ODPEM	TBA	
13	To provide General furniture	during the Project	ODPEM	TBA	
14	To ensure connection between NWA's IP Core Backbone Network and DECOM	during the Project	ODPEM	TBA	
15	To install the security fences and gates in and around the Project sites and Guardhouse, if necessary	during the Project	ODPEM	TBA	
16	To provide the trainings for Initial operation and maintenance of the Equipment to the staff of the public organizations who will use the Equipment	during the Project	ODPEM	TBA	
17	To submit Project Monitoring Report	during the Project	ODPEM	0	MD

3. After the Project

NO	Items	Deadline	In charge	Cost	Ref.
1	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of operation and maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection and cleaning	After completion of the construction	ODPEM	TBA	
2	To provide the security to the Equipment	After the handing over of the Equipment	ODPEM	TBA	
3	To dispose the spent batteries properly	After the handing over of the Equipment	ODPEM	0	

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

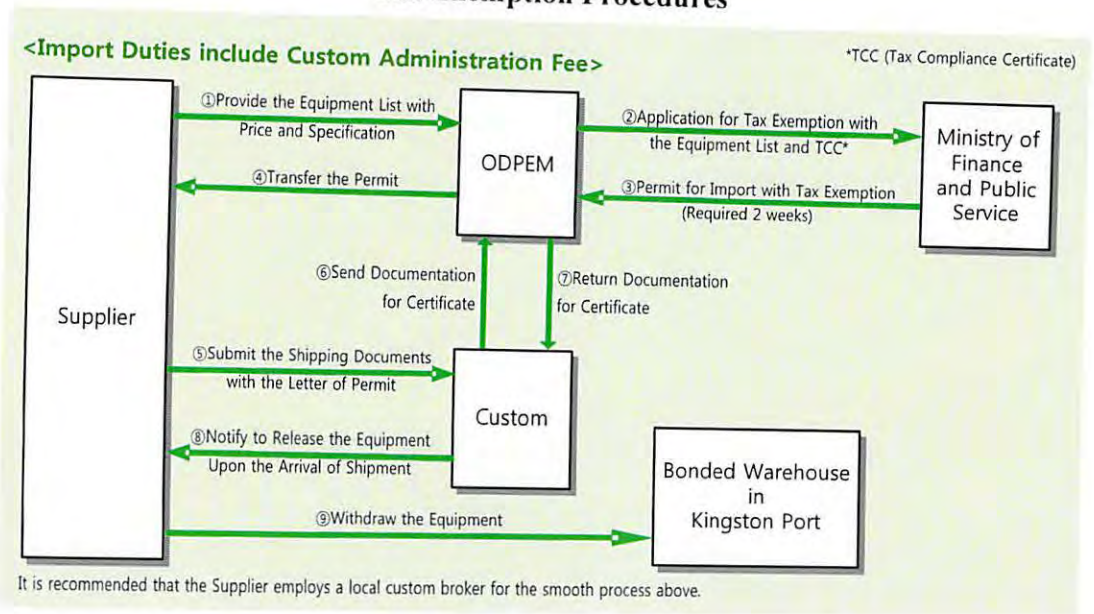
Major Undertakings to be Covered by the Japanese Grant

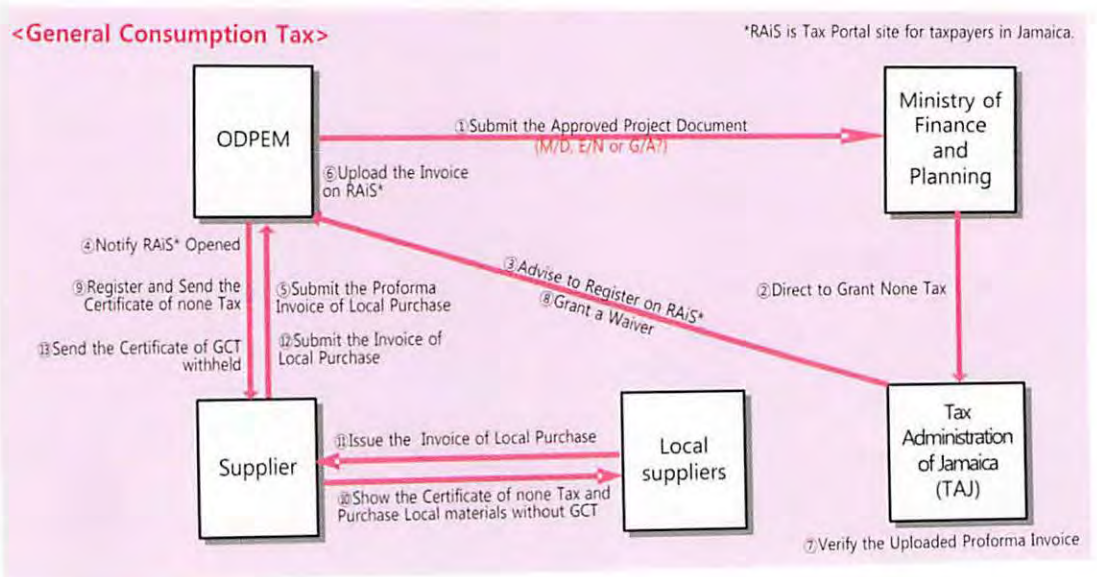
No	Items	Deadline	Cost Estimated (Million Japanese Yen)*	
1	Procurement, Installation & Construction			
	1) To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country			
	a) Marine(Air) transportation of the products from Japan to the recipient country			
	b) Internal transportation from the port of disembarkation to the project site		TBA	
	2) To provide equipment with installation and commissioning			
	TBD			
	3) Technical Training for engineers.			
2	To implement detailed design, tender support and construction supervision (Consultant)		TBA	
	Total		TBA	

*; The cost estimates are provisional. This is subject to the approval of the Government of Japan.

Annex 7

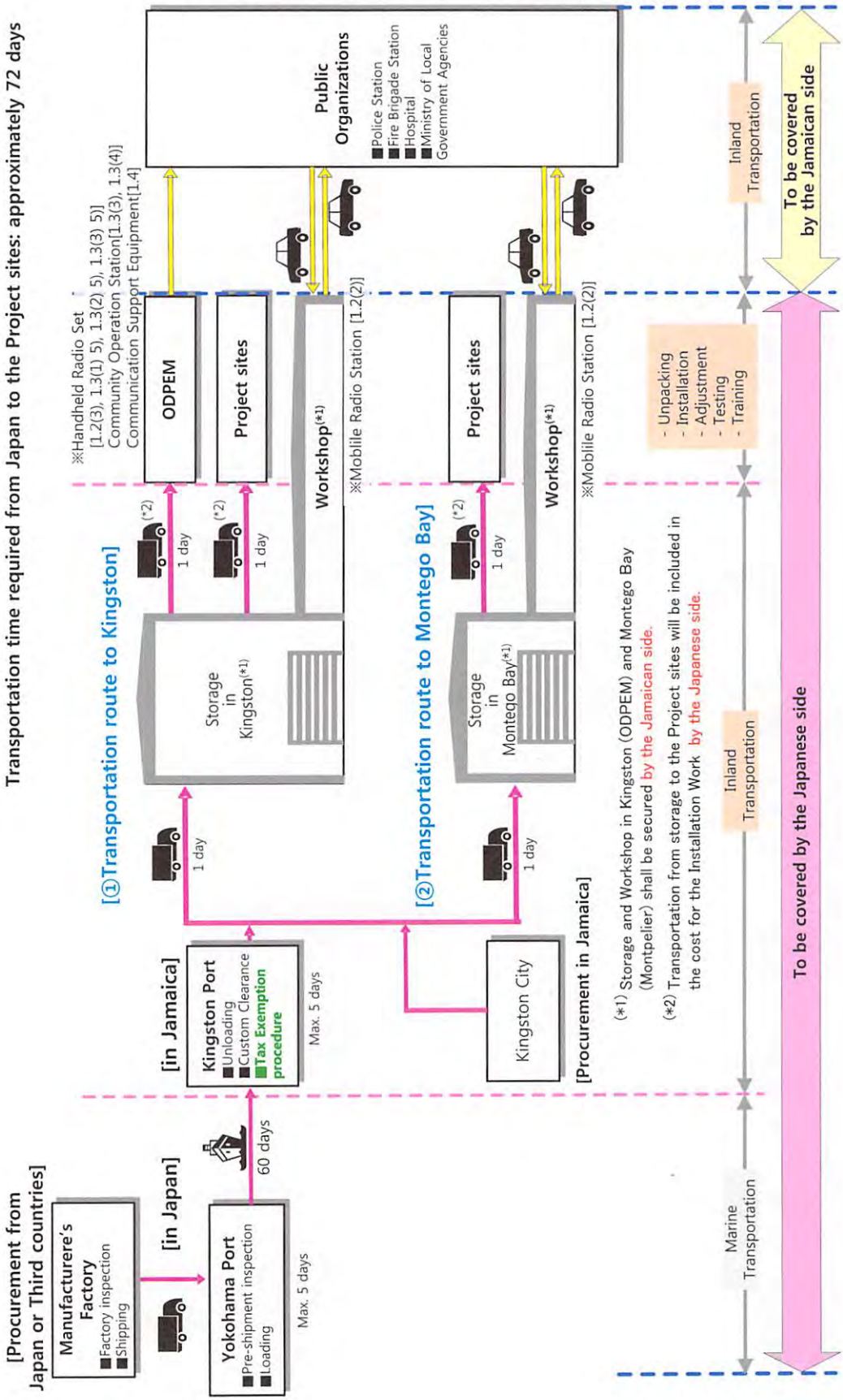
Tax Exemption Procedures





Annex 8

Plan for Transportation of the Equipment



(3) 3rd Field Survey

Minutes of Discussions
on the Preparatory Survey for the Project for
Improvement of Emergency Communication System
(Explanation on Draft Preparatory Survey Report)

With reference to the minutes of discussions signed between Office of Disaster Preparedness and Emergency Management (hereinafter referred to as "ODPEM") and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on July 16, 2015 and in response to the request from the Government of Jamaica dated December 24, 2014, JICA dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") for the explanation of Draft Preparatory Survey Report (hereinafter referred to as "the Draft Report") for the Project for Improvement of Emergency Communication System (hereinafter referred to as "the Project"), headed by Masayuki FURUKAWA, Deputy Director, Team1, Transportation and ICT Group, Infrastructure and Peacebuilding Department, and is scheduled to stay in the country from August 30, 2016 toSeptember 7,2016.

As a result of the discussions, both sides agreed on the main items described in the attached sheets.

, , 2016
Kingston, Jamaica

OFFICE OF DISASTER PREPAREDNESS AND EMERGENCY MANAGEMENT
7/12/16
DIRECTOR GENERAL
CLIVE C. DAVIS

Masayuki FURUKAWA
Leader, Preparatory Survey Team
Japan International Cooperation Agency
Japan

ATTACHEMENT

1. Contents of the Draft Report
   After the explanation of the contents of the Draft Report by the Team, the Jamaica side agreed to its contents.

2. Cost Estimate
   Both sides confirmed that the cost estimate including the contingency described in Annex 6 and the Draft Report is provisional and will be examined further by the Government of Japan for its approval. The contingency would cover the additional cost against natural disaster, unexpected natural conditions, etc.

3. Confidentiality of the Cost Estimate and Technical Specifications
   Both sides confirmed that the cost estimate and technical specifications in Annex 6 and the Draft Report should never be duplicated or disclosed to any third parties until all the contracts under the Project are concluded.

4. Procedures for Japanese Grant
   The Jamaica side agreed that the procedures as described in Annex 3, Annex 4 and Annex 5 shall be applied to the Project. In addition, the Jamaica side agreed to take necessary measures according to the procedures.

5. Timeline for Project Implementation
   The Team explained to the Jamaica side that the expected timeline for the project implementation is as attached in Annex 8.

6. Expected Outcomes and Indicators
   Both sides agreed that key indicators for expected outcomes are as follows. The Jamaica side will be responsible for the achievement of agreed key indicators targeted in year 2021 and shall monitor the progress based on those indicators.

[Quantitative Effect]

Indicator-	Reference Value (Year 2016)	Target Value (Year 2021)
Number of Voice line of Disaster Emergency Communication System (exclude a control channel)	1 channel for all over the country	3 or 6 channels per Radio Repeater Station
Coverage for Community in Disaster Vulnerable Area of Disaster Emergency Communication System	25%	90%
Number of organizations of Disaster Emergency Communication System	20	52
Transmission standard time from ODPEM to Community	60 Minutes	5 Minutes
Beneficiary of Early Warning System (Number of residents)	2,600	16,000

[Qualitative Effect]

- Securing of a dedicated/stable disaster prevention network
- Disaster prevention effect

7. Technical Guidance

Considering the sustainable operation and maintenance of the products and services granted through the Project, Technical guidance is planned under the Project. The Jamaica side confirmed to deploy necessary number of counterparts who are appropriate and competent in terms of its purpose of the technical assistance as described in the Draft Report.

8. Undertakings of the Project

Both sides confirmed the undertakings of the Project as described in Annex 6, which will be used as an attachment of G/A.

With regard to exemption of customs duties, internal taxes and other fiscal levies as stipulated in 2.2 of Annex 6, both sides confirmed that such customs duties, internal taxes and other fiscal levies shall be clarified in the bid documents by ODPEM and shall be exempted during the implementation stage of the Project.

The Jamaica side assured to take the necessary measures and coordination including allocation of the necessary budget which are preconditions of implementation of the

Project. It is further agreed that the costs are indicative, i.e. at Outline Design level. More accurate costs will be calculated at the Detailed Design stage.
Both sides also confirmed that the Annex 6 will be used as an attachment of G/A.

9. Tax Examption Process

Both sides confirmed the tax examption process as Annex 7. Jamaica Side agreed to start tax examption process after official aggrement of the Project between Both government is concluded.

10. Monitoring during the Implementation

The Project will be monitored at the timing designated in Annex 8 by the Executing Agency and reported to JICA by using the form of Project Monitoring Report (PMR) attached as Annex 9.

11. Ex-Post Evaluation

JICA will conduct ex-post evaluation three (3) years after the project completion with respect to five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact, Sustainability) of the Project. Result of the evaluation will be publicized. The Jamaica side is required to provide necessary support for the data collection.

12. Schedule of the Study

JICA will finalize the Preparatory Survey Report based on the confirmed items and send it to the Jamaica side around November, 2016.

13. Proper Use

The Jamaica side confirmed the items requested will be used only for the objective of the Project and not to be used for other purposes; for example, military operations.

14. Other Relevant Issues

14-1. Operation and Maintenance of the Facilities and Equipment

The team explained the importance of operation and maintenance of the products and services granted under the Project considering that proper asset management impacts greatly on their service life and reduction of maintenance cost. The Jamaica side shall secure enough staff and budgets necessary for appropriate operation and maintenance of the facilities. The annual operation and maintenance costs are estimated and described in the Draft Report.

14-2. Equipment Renewal Cost

The team explained the estimation of the equipment renewal cost for the Project. The Jamaica side understood that it is desirable to establish a reserve fund to cover the cost.

14-3. Disclosure of Information

Both sides confirmed that the Preparatory Survey Report which project cost is excluded will be disclosed to the public after completion of the Preparatory Survey. The comprehensive report including the project cost will be disclosed to the public after all the contracts under the Project are concluded.

14-4. Coverage footprint of Disaster Emergency Communication System

Due to the nature of radio wave, the coverage footprint of the repeaters stations in Disaster Emergency Communication System planned under the Project may not partly cover the designated area. The Jamaican side is required to improve the coverage footprint through reconfigulation of the network by using transportable repeater stations to be procured under the Project or other measures, if necessary.

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Annex 8 Project Implementation Schedule
Annex 9 Project Monitoring Report (Template)

Project Site

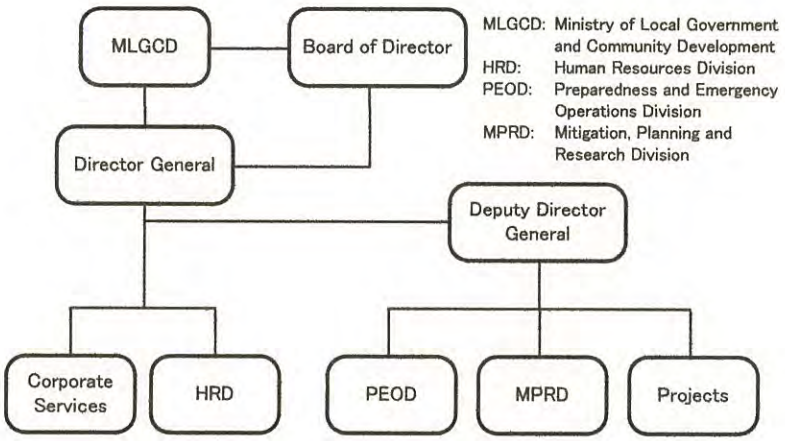
Location of Jamaica in Central and South America

All Jamaica

Annex 2

Organization Chart

Office of Disaster Preparedness and Emergency Management (ODPEM)



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(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the Government of

Japan and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles, in accordance with the E/N, to implement the Project, to implement the Project, such as payment procedures, responsibilities of the Government of the recipient country, and procurement policies.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. The Grant may be used for the purchase of the products or services of a third country, if necessary, taking into account the quality, competitiveness and economic rationality of products and services necessary for achieving the objective of the Project. However, the prime contractors, in relation to construction and procurement are limited to Japanese nationals. Additionally, in principle, the composition of the prime consulting firm is also limited to Japanese nationals.

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals, in principle. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Project, the recipient country is required to undertake such necessary measures as Annex 6.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant.

(7) "Export and Re-export"

The products purchased under the Grant should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"), in principle. JICA will execute the Grant by making payments in Japanese yen, in principle, to cover the obligations incurred by the Government of the recipient country or its designated authority under the verified contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations

The Government of the recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and "JICA Guidelies for Environmental and Social Considerations (April 2010)."

(11) Monitoring

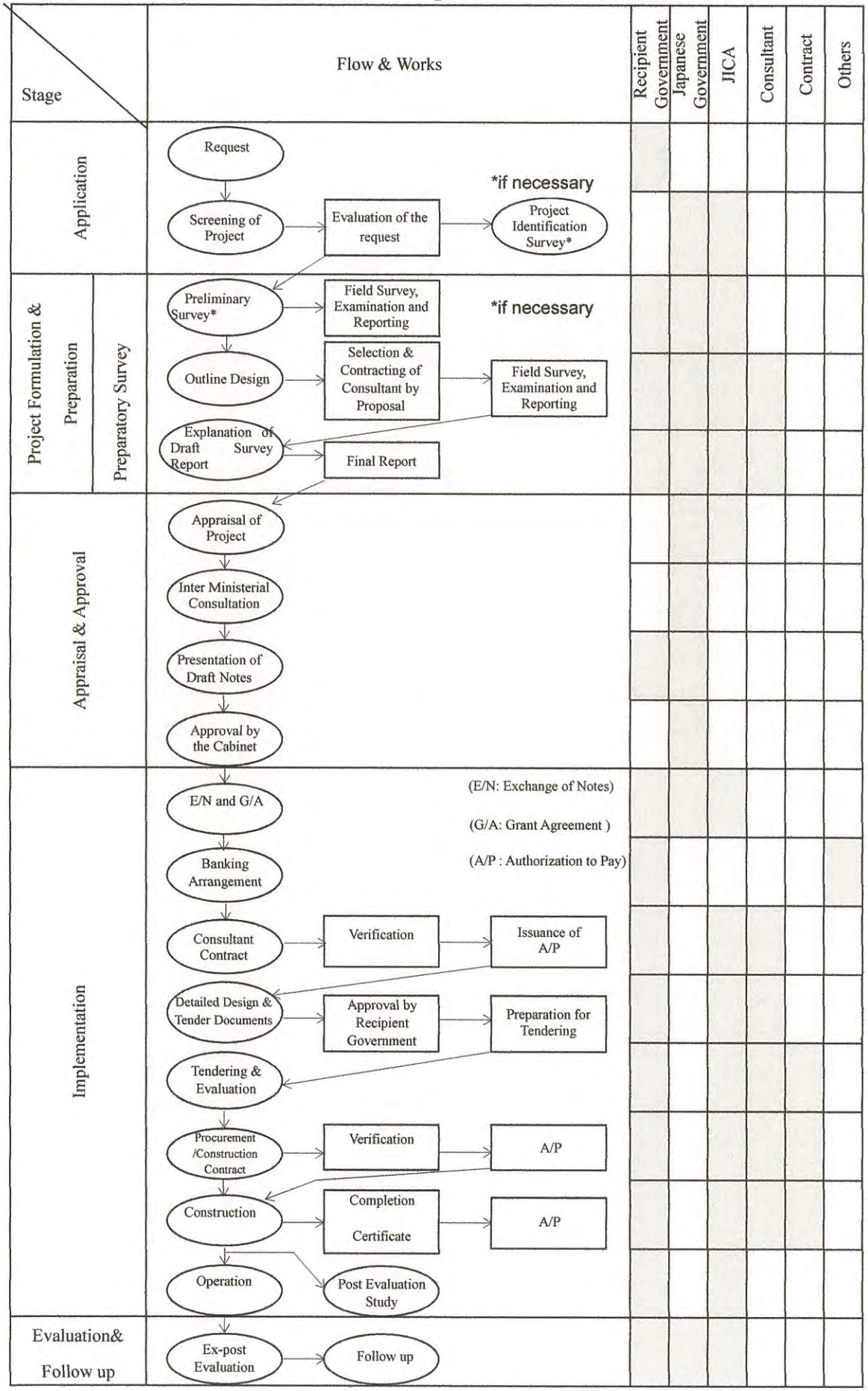
The Government of the recipient country must take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and must regularly report to JICA about its status by using the Project Monitoring Report (PMR).

(12) Safety Measures

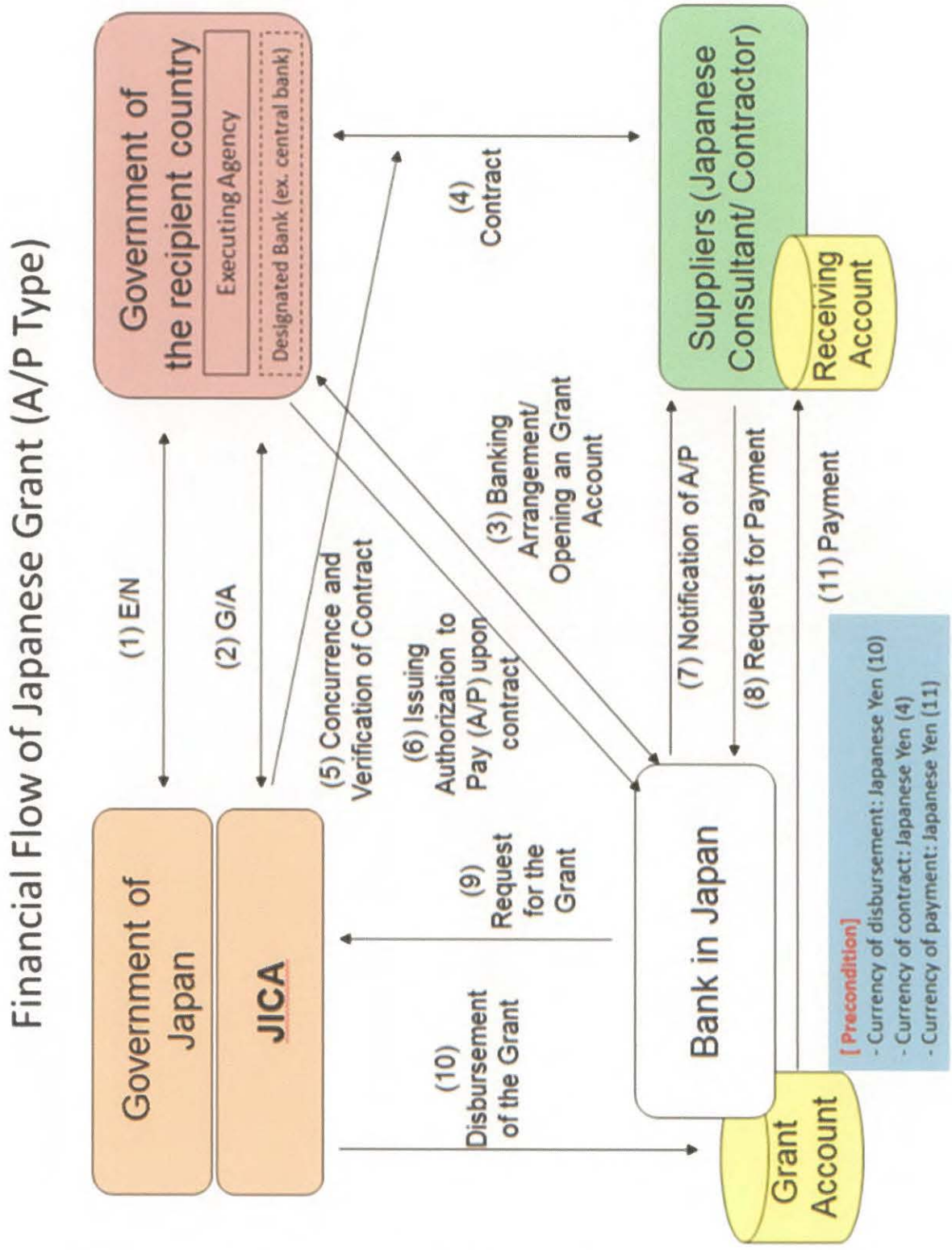
The Government of the recipient country must ensure that the safety is highly observed during the implementation of the Project.

Flow Chart of Japanese Grant Procedures

Annex 4



Financial Flow of Japanese Grant



(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

Annex 6

Major Undertakings to be taken by Recipient Government

1. Before the Tender

NO	Items	Deadline	In charge	Cost	Ref.
1	To open Bank Account (Banking Arrangement (B/A))	within 1 month after G/A	MOFP		
2	To obtain the confirmation letter for 1) Acquiring permission to use lands and antenna towers for Radio Repeater Stations 2) Acquiring permission for installation of HF-SSB, VHF Base Station, UHF Base Station and Power Supply System at NEOC, PEOC and Community. 3) Acquiring permission for installation of Mobile Radio Station on vehicles of the public organizations (Police Station, Fire Brigade Station, Hospital and Ministry of Local Government Agencies) 4) New frequencies for the Microwave Link and new UHF frequencies for the Radio Repeater Stations including necessary arrangement for allocation of those frequencies.	before notice of the tender document	ODPEM	25,000 (JMD)	1)Rent fee is required for the Hut in Planters Hall
4	To Securing the capacity of NWA's IP Core Backbone Network for DECOM	before notice of the tender document	ODPEM		
5	To bear the following commissions to a bank of Japan for the banking services based upon the B/A				
	Advising commission of A/P	within 1 month after the singing of the contract	ODPEM	10,000 (JMD)	Approx. 5,000 (JMD) / time
	Payment commission for A/P	every payment	ODPEM	1,473,000 (JMD)	

2. During the Project Implementation

NO	Items	Deadline	In charge	Cost	Ref.
1	To secure lands for installation of equipment, bush clearing and removal of obstacles in the Project sites	Before the project start	ODPEM		
2	To construct access roads to the Project sites, if necessary	Before the project start	ODPEM		
3	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work	during the Project	ODPEM		
4	To assure the security for personnel in the Project sites, when necessary	during the Project	ODPEM		
5	To submit Project Monitoring Report at the fixed points	during the Project	ODPEM		Annex 8
6	To secure the following storages, facilities, sites, yard, etc.; 1) Storages for the Equipment in Kingston and Montego Bay 2) Temporary offices for the Consultant and the Supplier 3) Sites for material storing yard 4) Temporary construction yard 5) Waste disposal around the Project sites 6) Workshop in Kingston and Montego Bay for the installation of the Mobile Radio Station to the vehicles of the public organization	during the Project	ODPEM		
7	To ensure that custom duties and internal taxes which may be imposed in the country of the Recipient with respect to the purchase of the Products and/or the Services be exempted, such as,	during the Project	ODPEM		Annex 7

NO	Items	Deadline	In charge	Cost	Ref.
	1) Custom Duties; Import Duty, Custom Administration Fee 2) Internal Taxes; General Consumption Tax, Withholding Tax on Special Services 3) Other Fiscal Levies; Contractors Levy, Environmental Levy, Standards Compliance Fee				
8	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country	during the Project	ODPEM		
9	Internal transportation from the stations to the Project sites 1) Secure the storage for the Equipment in Kingston and Montego Bay 2) Internal transportation from the storage of Kingston and Montego Bay to the Project sites 3) Transportation of the vehicles to the Mobile Radio Station workshop 4) Distribution of the vehicles installed Mobile Radio Station to the public organizations	during the Project	ODPEM		
10	To provide General furniture	during the Project	ODPEM	19,000 (JMD)	
11	To obtain the confirmation letter for 1) Permission of the Installation Work at the Project sites 2) Permission to enter the Project sites	before commencement of the Installation Work	ODPEM		
12	To ensure the required power supplies 1) for the equipment to be installed in the existing building 2) for the new repeater huts	before commencement of the Installation Work	ODPEM	421,000 (JMD)	
13	To Establish of Maintenance Center	before commencement of the Installation Work	ODPEM		
14	To install the security fences and gates in and around the Project sites and Guardhouse, if necessary	before commencement of the Installation Work	ODPEM		
15	To rehabilitate the existing repeater huts	before commencement of the Installation Work	ODPEM	2,625,000 (JMD)	
16	To clear and remove the existing equipment/facilities in the existing repeater stations	before commencement of the Installation Work	ODPEM	300,000 (JMD)	
17	To allocate one (1) additional staff for operation and maintenance work	before commencement of the Installation Work	ODPEM	5,000,000 (JMD)	
18	To ensure connection between NWA's IP Core Backbone Network and DECOM	before commencement of the Installation Work	ODPEM		
19	To provide the trainings for Initial operation and maintenance of the Equipment to the staff of the public organizations who will use the Equipment	after the Installation Work	ODPEM		
20	To distribute the Handheld Radio Set, Community Operation Station, Operation Station for Cay and Communication Support Equipment to each location	after the Installation Work	ODPEM		
21	To bear all the expenses, other than those to be borne by the Grant Aid	during the Project	ODPEM	-	

3. After the Project

NO	Items	Deadline	In charge	Cost	Ref.
1	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of operation and maintenance cost (including additional 1 staff) 2) Operation and maintenance structure 3) Routine check/Periodic inspection and cleaning (Especially Solar panel should be cleaned every month.)	After completion of the construction	ODPEM	8,779,000 (JMD)	
2	To provide the security to the Equipment	After the handing over of the Equipment	ODPEM		
3	To dispose the spent batteries properly	After the handing over of the Equipment	ODPEM		
4	To conduct inventory check of the Handheld Radio Set 1) Periodical inventory check 2) Periodical report about result of inventory check to JICA Jamaica Office	After the handing over of the Equipment	ODPEM		Twice a year

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

Major Undertakings to be Covered by the Japanese Grant
(Confidential)

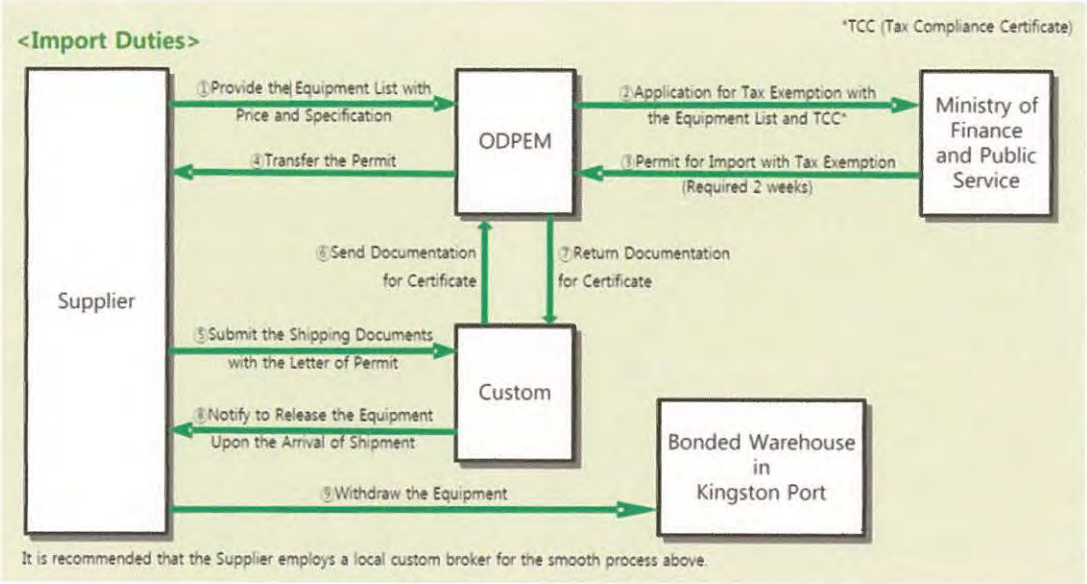
This section is closed due to confidentiality.

*; The cost estimates are provisional. This is subject to the approval of the Government of Japan.

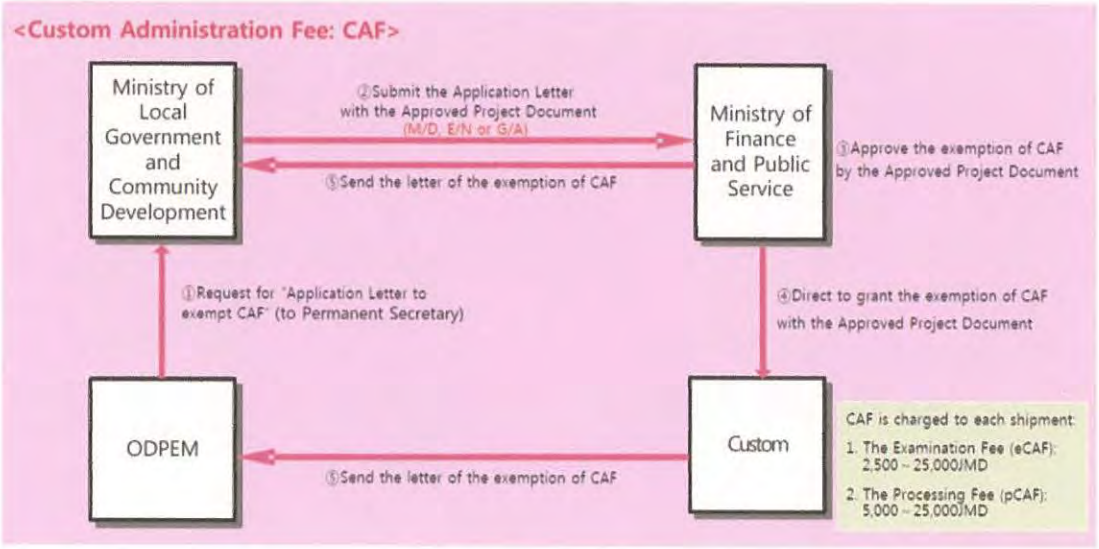
Annex 7

Tax Exemption Procedures

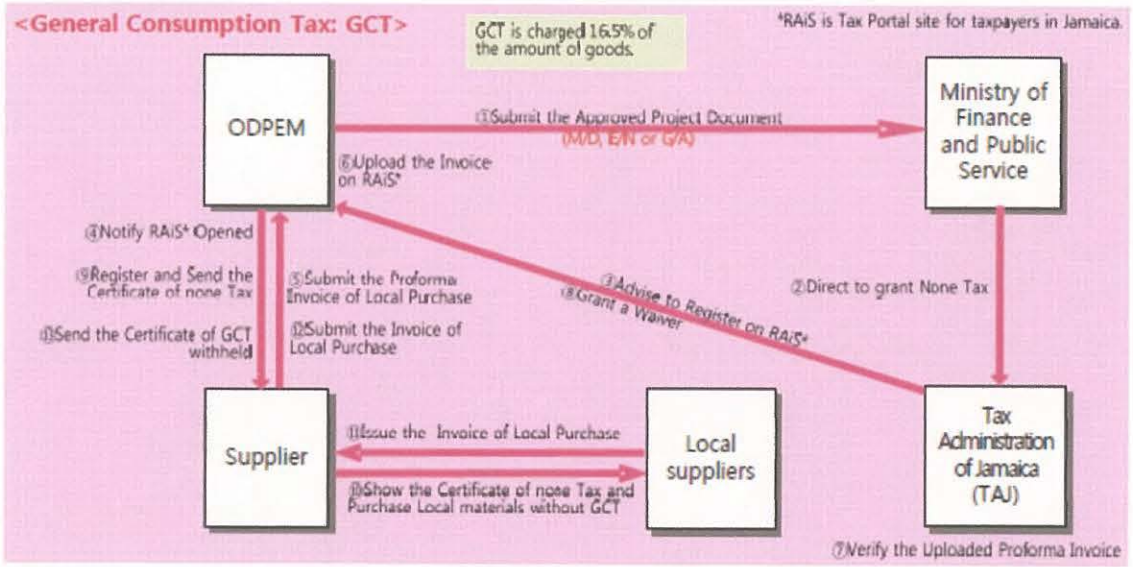
① Import Duties



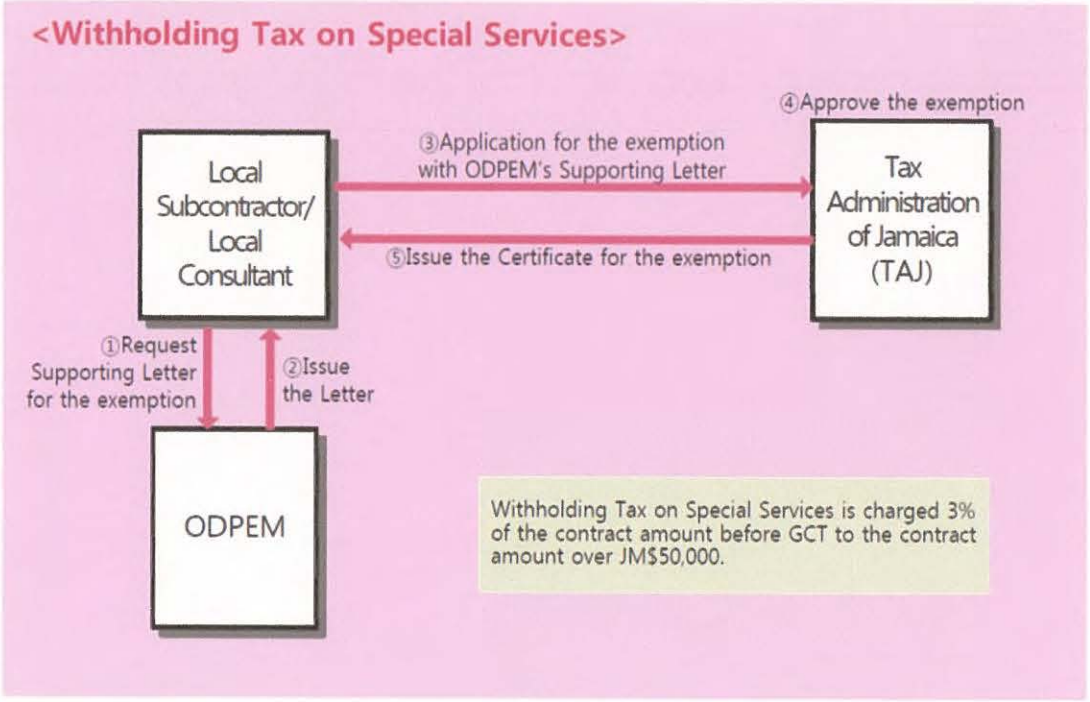
② Custom Administration Fee



③ General Consumption Tax



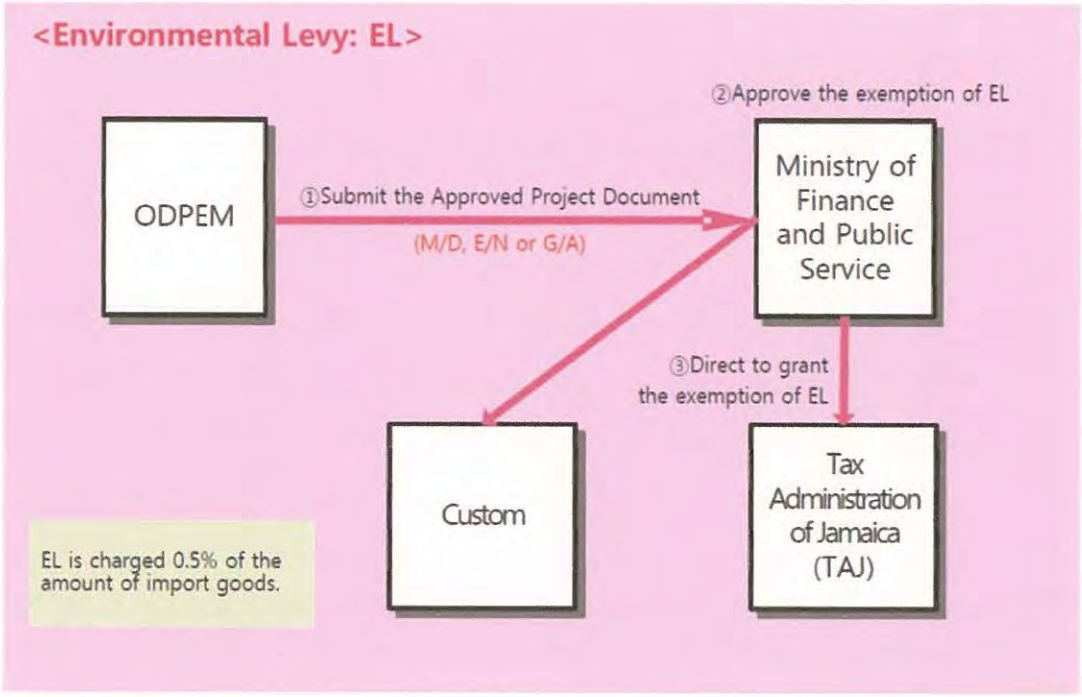
④ Withholding Tax on Special Services



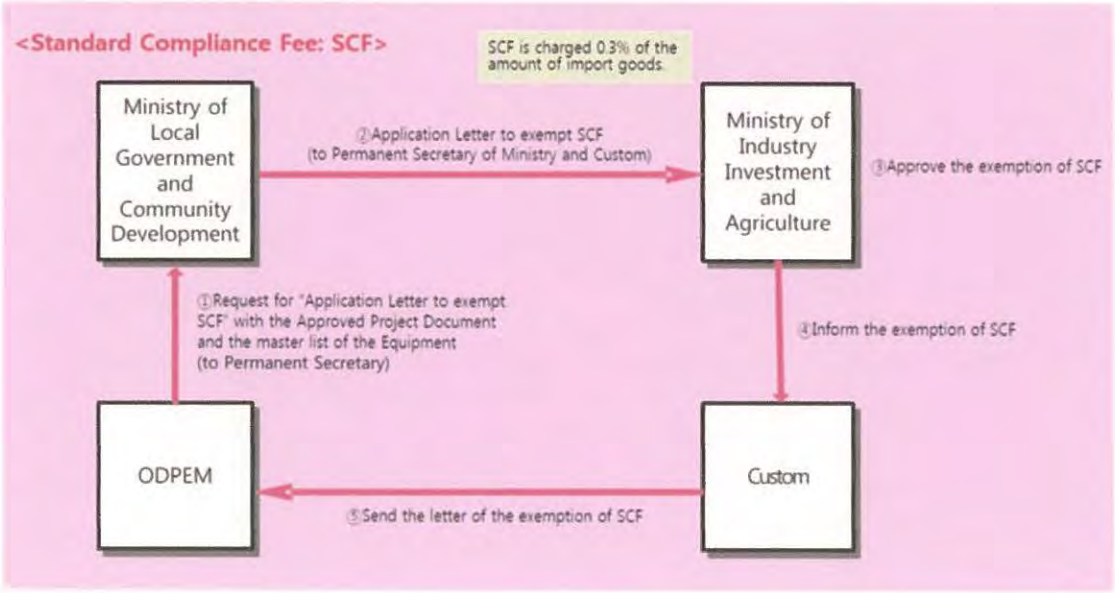
⑤ Contractors Levy

Contractors Levy will be exempt after the Jamaican party of the contract submit the approved project document (E/N or G/A) to the tax authority.

⑥ Environmental Levy



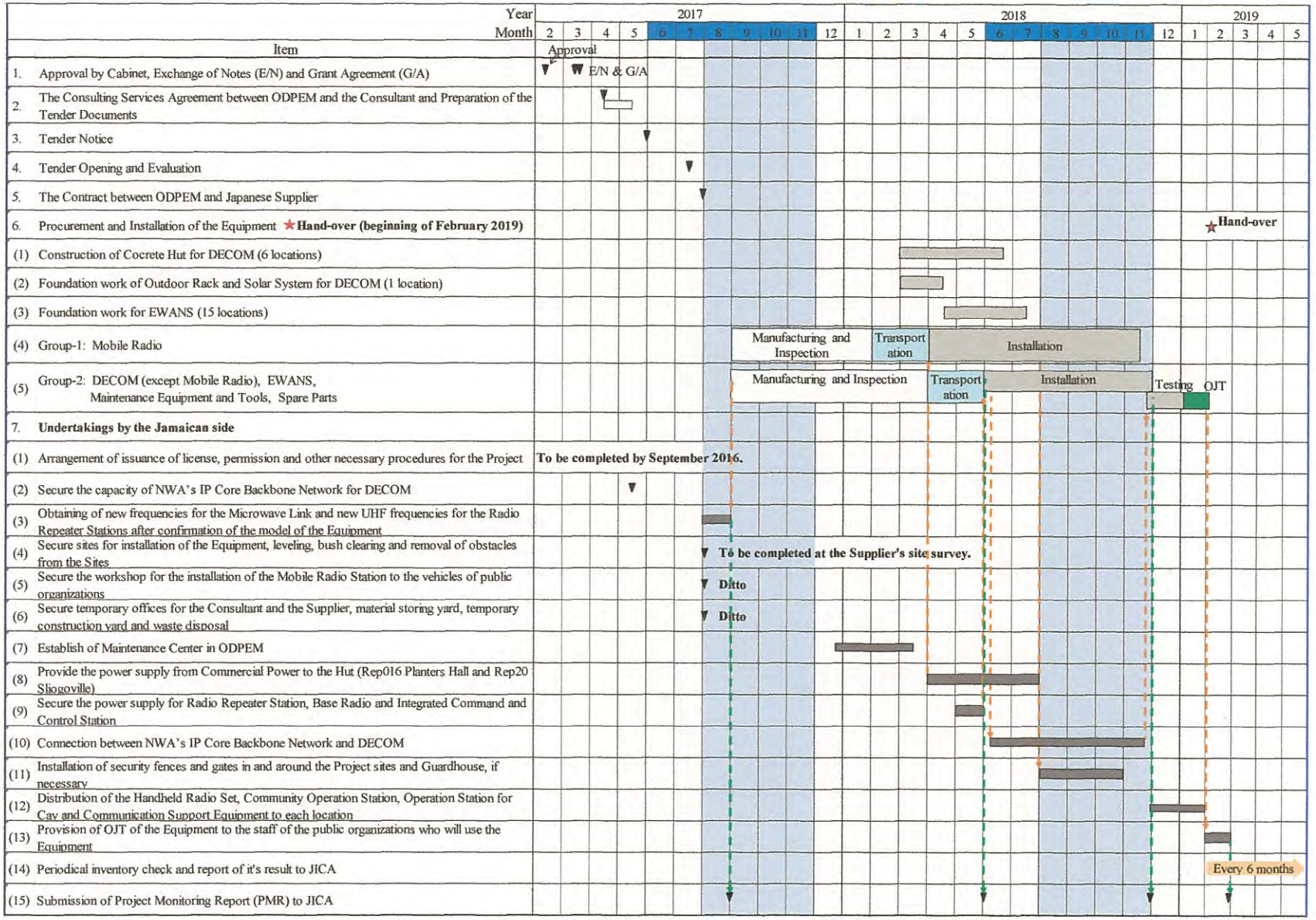
⑦ Standards Compliance Fee



Annex 8

Project Implementation Schedule

Hurricane Season | Rainy period in Hurricane Season



Project Monitoring Report
on
Project Name
Grant Agreement No. XXXXXXX

20XX, Month

Organization Information

Signer of the G/A	_____ Person in Charge _____ (Division) _____ Contacts Address: _____ Phone/FAX: _____ Email: _____
Executing Agency	_____ Person in Charge _____ (Division) _____ Contacts Address: _____ Phone/FAX: _____ Email: _____
Line Ministry	_____ Person in Charge _____ (Division) _____ Contacts Address: _____ Phone/FAX: _____ Email: _____

Outline of Grant Agreement:

Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____
Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:

1: Project Description

1-1 Project Objective

1-2 Necessity and Priority of the Project

- Consistency with development policy, sector plan, national/regional development plans and demand of target group and the recipient country.

1-3 Effectiveness and the indicators

- Effectiveness by the project

Quantitative Effect (Operation and Effect indicators)		
Indicators	Original (Yr)	Target (Yr)
Qualitative Effect		

2: Project Implementation

2-1 Project Scope

Table 2-1-1a: Comparison of Original and Actual Location

Location	**Original:** *(M/D)* **Attachment(s):Map**	**Actual:** *(PMR)* **Attachment(s):Map**

Table 2-1-1b: Comparison of Original and Actual Scope

Items	Original	Actual
(M/D) 'Soft component' shall be included in 'Items'.	*(M/D)*	*(PMR)* Please state not only th e most updated schedul e but also other past re visions chronologically. All change of design shal l be recorded regardless of its degree.

2-1-2 Reason(s) for the modification if there have been any.

(PMR)

2-2 Implementation Schedule
2-2-1 Implementation Schedule

Table 2-2-1: Comparison of Original and Actual Schedule

Items	Original		Actual
	DOD	G/A	
【M/D】 'Soft component' shall be stated in the column of 'Items'. Project Completion Date*	*(M/D)*		*(PMR)* As of (Date of Revision) Please state not only the most updated schedule but also other past revisions chronologically.

*Project Completion was defined as _____ at the time of G/A.

2-2-2 Reasons for any changes of the schedule, and their effects on the project.

2-3 Undertakings by each Government
2-3-1 Major Undertakings
See Attachment 2.

2-3-2 Activities
See Attachment 3.

2-4 Project Cost
2-4-1 Project Cost

Table 2-4-1a Comparison of Original and Actual Cost by the Government of Japan

(Confidential until the Tender)

Items			Cost (Million Yen)	
	Original	Actual	Original	Actual
Construction Facilities (or Equipment)	'Soft component' shall be included in 'Items'.			Please state not only the most updated schedule but also other past revisions chronologically.
Consulting Services	- Detailed design -Procurement Management -Construction Supervision			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

Table 2-4-1b Comparison of Original and Actual Cost by the Government of Jamaica

Items			Cost (JMD)	
	Original	Actual	Original	Actual
				Please state not only the most updated schedule but also other past revisions chronologically.
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = (local currency)

2-4-2 Reason(s) for the wide gap between the original and actual, if there have been any, the remedies you have taken, and their results.

(PMR)

2-5 Organizations for Implementation

2-5-1 Executing Agency:

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original: *(M/D)*
Actual, if changed: *(PMR)*

3: Operation and Maintenance (O&M)

3-1 O&M and Management

- Organization chart of O&M
- Operational and maintenance system (structure and the number ,qualification and skill of staff or other conditions necessary to maintain the outputs and benefits of the project soundly, such as manuals, facilities and equipment for maintenance, and spare part stocks etc)

Original: *(M/D)*
Actual: *(PMR)*

3-2 O&M Cost and Budget

- The actual annual O&M cost for the duration of the project up to today, as well as the annual O&M budget.

Original: *(M/D)*

4: Precautions (Risk Management)

- Risks and issues, if any, which may affect the project implementation, outcome, sustainability and planned countermeasures to be adapted are below.

Original Issues and Countermeasure(s): *(M/D)*	
Potential Project Risks	Assessment
1.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:

	Action during the Implementation:
	Contingency Plan (if applicable):
2.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
3.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
Actual issues and Countermeasure(s)	
(PMR)	

5: Evaluation at Project Completion and Monitoring Plan

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan for the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

Attachment

1. Project Location Map
2. Undertakings to be taken by each Government
3. Monthly Report
4. Report on RD
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (Final Report Only)

A5. Summary of the Survey Results on Repeater Sites

5. Summary of the Survey Results on Repeater Sites

1. Summary of the Survey Results on Repeater Sites

Shows the site deleted. Shows the site where the new hut is required.

	Site		Location (GPS Receiver Data)		Height (ASL)	LOS of microwave link	Tower		Hut						Security	Decision of Site Survey Result	Remarks	
	Site Code	Site Name	Longitude (DD°MM'SS.S")	Latitude (DD°MM'SS.S")	Google Earth Data (m)	Result	Owner	Availability for Installation*1	Owner	Availability for Installation*1	Power supply	Grounding	Air Conditioning	Land owner of new hut (When needed)	Gate and Fence		Technical remarks	Items to be done by the Jamaican side (See common requirement*2)
-	Rep001	~~Bamboo~~	18°23'38.9"N	77°16'12.8"W	700	OK	JPS	OK(A)	JPS	OK(B)	OK (Back-upped)	Exists	Exists	N/A	Exists (Partially damaged, but secure site)	OK	- DECOM rack has to be separated as JPS's hut is almost full. - LOS to Bamboo NWA is critical. - To concern to replace with Alt004	Existing VHF repeater antenna, existing equipment in requested equipment position to be removed/adjusted.
1	Rep002	Murphy Hill	18°22'58.3"N	77°07'45.5"W	506	OK	JPS	OK(A)	JPS	OK(B)	OK (Back-upped)	Exists	Exists	N/A	Exists (Partially damaged, but secure site)	OK		- Inside of the hut to be renovated especially ceiling. - Existing racks and batteries to be adjusted the position.
2	Rep003	Bonny Gate	18°19'17.4"N	76°57'00.4"W	481	OK	JPS	OK(A)	JPS	OK(B)	OK (Back-upped)	Exists	Exists	N/A	Not exists (Secure place by care taker)	OK		- Existing racks and batteries to be adjusted the position. - Existing ODPEM's VHF repeater antenna to be removed.
-	Rep004	~~Oracabessa~~					JPS		JPS								To be deleted from the candidate site because of small coverage	
-	Rep005	~~Black Hill~~					Digicel		Digicel								To be deleted from the candidate site because of small coverage	
3	Rep006	Shotover	18°10 '24.7"N	76°29'02.1"W	319	OK	JPS	OK(A)	JPS	OK(C)	OK (Non Back-upped)	Exists	Exists but broken	GN Holdings	Exists	OK	- New container to be installed at proposed position. - Demarcation point of electric power shall be determined before the installation.	
4	Rep007	Castle Mountain	18°08 '07.8"N	76°21'38.9"W	322	OK	TVJ	OK(A)	JPS	OK(B)	OK (Non-Back-upped)	Exists	Exists but broken	N/A	Not exists (Not required)	OK		- Inside of the hut to be renovated - Door of the hut to be replaced - Air conditioner to be replaced - Existing ODPEM's VHF repeater antenna to be removed
-	Rep008	~~Rolandsfield~~															To be deleted from the candidate site because of small coverage	
5	Rep009	Needhams Pen	17°54'16.1"N	76°22'42.0"W	231	OK	JPS	OK(A)	JPS	OK(B)	OK (Non-Back-upped)	Exists	Exists but broken	N/A	Exists (Damaged, but secure site)	OK		- Inside of equipment room to be renovated. - Air conditioner to be replaced.
6	Rep010	Yallas Hill	17°53'43.2"N	76°30'21.1"W	674	OK	COMTRON	OK(A)	JPS	OK(B+)	OK (Back-upped)	Exists	Exists	N/A	Not exists (Secure site)	OK		

	Site		Location (GPS Receiver Data)		Height (ASL)	LOS of microwave link	Tower		Hut						Security	Decision of Site Survey Result	Remarks	
	Site Code	Site Name	Longitude (DD°MM'SS.S")	Latitude (DD°MM'SS.S")	Google Earth Data (m)	Result	Owner	Availability for Installation*1	Owner	Availability for Installation*1	Power supply	Grounding	Air Conditioning	Land owner of new hut（When needed)	Gate and Fence		Technical remarks	Items to be done by the Jamaican side (See common requirement*2)
7	Rep011	Cabbage Hill	17°57'46.5"N	76°34'57.4"W	976	OK	JCF	OK(A)	JPS	OK(C)	OK (Back-upped) TBC	New hut	New hut	JCF (Land owner: NLA)	Not exists (Secure site)	OK	- New hut to be installed at proposed position. - To confirm availability of back-upped power.	
8	Rep012	Marley Hill	17°57'04.0"N	76°53'14.4"W	165	OK	JPS	OK(A)	JPS	OK(B+)	OK（Back-upped)	Exists	Exists	N/A	Exists	OK		- Existing equipmenr on the proposed new rack position to be removed. - Gap around existing old air conditioner to be filled.
9	Rep013	Juan-DE-Bolas	18°05'14.1"N	77°08'51.9"W	822	OK	Flow	OK(A)	JPS	OK(B+)	OK（Back-upped)	Exists	Exists	N/A	Exists	OK	Battery rack shall be lower tray-type as there is a height limitation at the position.	Existing SHF antenna at proposed UHF antenna position to be removed.
10	Rep014	Catherine's Peak	18°04'37.9"N	76°42'09.8"W	1504	OK	JPS	OK(A)	JPS	OK(B)	OK（Back-upped)	Exists	Exists (Under repairing)	N/A	Not exists (Secure site)	OK	- Equipment rack #1 and #2 to be without enclosure type to comply with space/room limitation. - Equipment rack #3 (Battery) shall be lower tray-type to comply with height limitation at the position. - To concern UHF antenna position to avoid interference/suppression from existing FM radio station.	- Existing JPS's VHF repeater antenna on proposed UHF repeater antenna position to be shifted. - Existing battery rack on proposed new battery rack position to be removed. - Ceiling to be renovated/repainted. - Gap around existing old air conditioner to be filled.
11	Rep015	Coopers Hill	18°04'23.7"N	76°51'08.7"W	759	OK	JCF	OK(A)	MET	OK(B)	OK（Back-upped)	Not exists	Not exists	N/A	Exists	OK	- To concern UHF antenna position to avoid interference/suppression from existing S-band radar.	- Electric power with circuit breaker and power outlet (Back-upped), Grounding, Air conditioner to be provided in the equipment room (Room5) . - Objects in Room5 to be removed. - Gap around window in Room5to be filled.
12	Rep016	Planters Hall	17°59'59.9"N	77°09'29.5"W	381	OK	COMTRON	OK(A)	COMTRON	OK(B)	Not exists	Not exists	Not exists	N/A	Exists	OK		- To provide in the equipment room : Electric power with circuit breaker and power outlet (from COMTRONS power distribution board), Grounding, Air conditioner, and Ceiling light. - To confirm if electric power supply is back-upped by COMTRON's generator. - Existing objects in proposed equipment room to be removed/cleared.
13	Rep017	Portland Cottage Lighthouse	17°44'32.6"N	77°09'27.2"W	157	OK	PAJ	OK(A)	PAJ	OK(C)	Not Available	Not exists	Not exists	PAJ	Exists	OK	- New outdoor Rack to be installed at proposed position. - There is no commercial power. - Very difficult to reach during bad weather (Swampy road)	To ensure MOU between ODPEM and PAJ on an operation procedure of power supply at the site.
14	Rep018	Ayr Hill	18°13'35.6"N	77°30'23.0"W	979	OK	JCAA /AEROTEL	OK(A)	JCAA /AEROTEL	OK(B+)	OK (Back-upped)	Exists	Exists	N/A	Exists	OK		- Existing rack on proposed position to be removed/adjusted. - Positions for new equipment in existing rack to be secured.

	Site		Location (GPS Receiver Data)		Height (ASL)	LOS of microwave link	Tower		Hut						Security	Decision of Site Survey Result	Remarks	
	Site Code	Site Name	Longitude (DD°MM'SS.S")	Latitude (DD°MM'SS.S")	Google Earth Data (m)	Result	Owner	Availability for Installation*1	Owner	Availability for Installation*1	Power supply	Grounding	Air Conditioning	Land owner of new hut（When needed)	Gate and Fence		Technical remarks	Items to be done by the Jamaican side (See common requirement*2)
15	Rep019	Huntley	18°05'20.7"N	77°35'17.9"W	918	OK	JCF	OK(A)	JPS	OK(A)	OK (Back-upped)	Exists	Exists	N/A	Exists	OK	- SHF antenna toward Rep018 Ayr Hill to be installed at higher than 15m +GL to avoid local ridge.	Existing racks and equipment on proposed new rack position to be removed/adjusted.
16	Rep020	Sliogoville	18°05'20.7"N	76°56'28.5"W	657	OK	Digicel	OK(A)	Digicel	OK(C)	NG (To be subscribed)	New hut	New hut	Digicel	Exists	OK	New hut to be installed at proposed position.	To subscribe electric power line with meter in the site (Digicel does not provide)
-	Rep021	~~Newport~~	17°57'01.9"N	77°30'25.9"W	810	OK	JCF	OK(A)	JPS	OK(B)	OK (Back-upped)	Exists	Exists	N/A	Exists	OK	- To be deleted from the candidate site because of small coverage - Special concern is needed for the racks as limited room/space in existing JPS's equipment room.	- Inside of the hut to be renovated (Especially ceiling) - Broken air conditioner to be removed and filled the gap.
-	Rep022	~~Malvern Monroe College Malvern~~					Digicel		Digicel								- To be deleted from the candidate site because of small coverage. - To concern to apply transportable repeater.	
17	Rep023	Shafton	18°10'21.8"N	77°59'31.7"W	758	OK	GN Holdings	OK(A)	JPS	OK(C)	OK (Non-Back-upped)	New hut	New hut	GN Holdings (TBC)	Exists	OK	- LOS between Rep024 is only confirmed by profile simulation. - New container to be installed at proposed position.	
18	Rep024	Mount Airy	18°15'20.3"N	78°19'44.7"W	131	OK	JPS	OK(A)	JPS	OK(C)	OK (Non-Back-upped)	New hut	New hut	JPS	Exists	OK	- LOS between Rep023 is only confirmed by profile simulation. - New container to be installed at proposed position.	
-	Rep025	~~Orange Hill Darliston~~					Digicel		Digicel								To be deleted from the candidate site because of small coverage	
19	Rep026	Birches Hill	18°23'11.2"N	78°05'47.8"W	513	OK	JPS	OK(A)	JPS	OK(B)	OK (Non-Back-upped)	Exists	Exists	N/A	Not exists (Secure site)	OK	To study strengthening battery concerning instability of commercial electric power at the site.	To remove existing batteries on new rack position.
20	Rep027	Kempshot	18°24'39.3"N	77°52'09.2"W	537	OK	JPS	OK(A)	JPS	OK(B)	OK (Back-upped)	Exists	Exists	N/A	Exists	OK		- To remove existing ODPEM's VHF repeater including antenna. - Doors of the existing hut to be replaced. - Gap in the wall of the hut to be filled up.
21	Rep028	Flower Hill	18°29'40.5"N	77°50'56.7"W	410	OK	JCF	OK(A)	JCF	OK(B)	OK (Back-upped)	Exists(Out side of the room)	Not exists	N/A	Exists	OK		- Inside of the hut to be renovated. - Air conditioner to be provided.

	Site		Location (GPS Receiver Data)		Height (ASL)	LOS of microwave link	Tower		Hut						Security	Decision of Site Survey Result	Remarks	
	Site Code	Site Name	Longitude (DD°MM'SS.S")	Latitude (DD°MM'SS.S")	Google Earth Data (m)	Result	Owner	Availability for Installation*1	Owner	Availability for Installation*1	Power supply	Grounding	Air Conditioning	Land owner of new hut (When needed)	Gate and Fence		Technical remarks	Items to be done by the Jamaican side (See common requirement*2)
22	Rep029	Duncans	18°28'19.0"N	77°32'10.0"W	150	OK	FLOW	OK(A)	JPS	OK(B+)	OK (Back-upped)	Exists	Exists	N/A	Exists	OK	LOS between Alt004 is only confirmed by profile simulation.	Water proof treatment for the roof of the hut to be renovated.
23	Rep030	Winchester	17°58'10.0"N	76°17'47.6"W	539	OK	Digicel	OK(A)	Digicel	OK(C)	OK (Back-upped)	New hut	New hut	Digicel	Exists (Damaged. Secured by camera)	OK	New hut to be installed at proposed position.	
24	Alt004	Free Hill	18°25'12.4"N	77°16'02.5"W	560	OK (TBC: Duncans)	COMTRON	OK(A)	JPS	OK(B)	OK (Non Back-upped)	Exists	Exists but broken	N/A	Not exists (Secured by camera)	OK	LOS between Rep029 Duncans is only confirmed by profile simulation.	- Inside of the hut to be renovated. - Air conditioner to be replaced - Existing JPS's rack and equipment to be removed.

2. Summary of the Survey Results on Microwave Link Repeater Sites

1	Mic001	Oracabessa	18°23'45.3"N	76°55'48.3"W	254	OK	TVJ	OK(A)	JPS (Equipment room)	OK(A)	OK (Back-upped)	Exists	Exists	N/A	Exists (Electric fence and Security camera)	OK		

***1 Legend:**

OK (A):	Available as it is.
OK (B):	Available if renovated/reinforced.
OK (C):	Available if new Tower or Hut provided (Land required)
NG (D):	NOT available. Need to find other candidate site
TBC:	To Be Confirmed

***2 Common requirements to be done by the Jamaican side.**

- Getting approval of the installation and property usage from the owners (Tower, Feeder route, Equipment Rack, Electric power, etc.)
- To secure proposed positions of the antenna, feeder route, and equipment rack or the equipment slots in existing rack before the installation.
- To remove/adjust the existing obstacles which may impede installation.

3. Summary of the Survey Results on NWA IP Core Backbone Sites

Shows the site deleted.

Site		Location (GPS Receiver Data)		Height (ASL)	LOS of microwave link	Tower		Hut						Security	Decision of Site Survey Result	Remarks	
Site Code	Site Name	Longitude (DD°MMSS.S")	Latitude (DD°MMSS.S")	Google Earth Data (m)	Result	Owner	Availability for Installation*1	Owner	Availability for Installation*1	Power supply	Grounding	Air Conditioning	Land owner of new container (When needed)	Gate and Fence		Technical remarks	Items to be done by the Jamaican side (See common requirement*2)
Nwa001	~~NWA HQ~~	N/A (Not use)															
Nwa002	Coopers Hill NWA	18°04'22.2"N	76°51'06.3"W	747	OK	JCAA /AEROTEL	OK(A)	JCAA /AEROTEL	OK(A)	OK (Back-upped by UPS)	Exists	Exists	N/A	Exists	OK		
Nwa003	Ayr Hill NWA	18°13'35.6"N	77°30'23.0"W	979	OK	JCAA /AEROTEL	OK(A)	JCAA /AEROTEL	OK(A)	OK (Back-upped by UPS)	Exists	Exists	N/A	Exists	OK	Interconnection between Nwa003 and Rep018 is available by CAT5 UTP cable (Length=10m) as both equipment are located in the same room.	
Nwa004	Paradise NWA	18°29'19.2"N	77°54'55.0"W	127	OK	JCAA /AEROTEL	OK(A)	JCAA /AEROTEL	OK(A)	OK (Buck-upped by Generator)	Exists	Exists	N/A	Exists	OK	UPS to be installed by the Japanese side.	
Nwa005	~~Kempshot NWA~~	18°24'20.6"N	77°51'45.6"W	541	OK	JCAA /AEROTEL	OK(A)	JCAA /AEROTEL	OK(A)	OK (Buck-upped)	Exists	Exists	N/A	Exists	OK	- To be deleted and replaced with Paradise (Nwa004) - TBC on time line of NWA's IP microwave link at this site. - TBC on details of equipment position and power source in the equipment room, and antenna installation.	- To clarify the time line of installation of NWA (JCAA) rack and antenna ASAP. - To secure equipment position in the rack and power source in the equipment room.
Nwa006	Bamboo NWA	18°23'13.5"N	77°15'43.8"W	701	OK	JCAA /AEROTEL	OK(A)	JCAA /AEROTEL	OK(A)	OK (Buck-upped by UPS)	Exists	Exists	N/A	Exists	OK		
Nwa007	Bonny Gate NWA	18°19'17.2"N	76°57'00.0"W	480	OK	N/A (Not use)	N/A	JCAA /AEROTEL	OK(A)	OK (Buck-upped by UPS)	Exists	Exists	N/A	No (Secure place with care taker)	OK	Interconnection between Nwa007 and Rep003 is available by CAT5 UTP outdoor cable (Length=40m)	
Nwa008	~~Catherine's Peak NWA~~	N/A (Not use)															

***1 Legend:**

OK (A):	Available as it is.
OK (B):	Available if renovated/reinforced.
OK (C):	Available if new Tower or Hut provided (Land required)
NG (D):	NOT available. Need to find other candidate site
TBC:	To Be Confirmed

***2 Common requirements to be done by the Jamaican side.**

- Getting approval of the installation and property usage from the owners (Tower, Feeder route, Equipment Rack, Electric power, etc.)
- To secure proposed positions of the antenna, feeder route, and equipment rack or the equipment slots in existing rack before the installation.
- To remove/adjust the existing obstacles which may impede installation.

A6. Summary of the Site Survey for the Base Radio Stations

6. Summary of the Site Survey for the Base Radio Stations

Summary of the Site Survey for the Base Radio Stations (Group-B)

Shows the site deleted.

Items			GPS Receiver Data (DD°MM'SS.S")		Height Above the See Level	LOS of Radio Repeater Station				Voice Call Merit Test (Sensitivity of Transceiver)		Electric Field Strength Measurement		Result of Electric Field Strength	Antenna Installation Plan&Method ・Type-A: Roof top mount ・Type-B: Roof edge mount ・Type-C: Ground Mast mount ・Type-D: Indoor Whip Antenna			Public Property	Site Design Result	Decision of Site Survey Result
Site Code	ODPEM Name	Official name	Longitude	Latitude	Google Earth Data (m)	Name of Target Repeater	Status (Visible/ Not Visible)	Path Length Between Repeater and Site (km)	Direction to Target Repeater (Degree)	Antenna Gain	Result	Antenna Gain	Field Strength (Measurement Level) (dBm)		Installation Type	Antenna Height (GL+m)	Feeder Length Out door (m)	Feeder Length Indoor (m)		
Min001	Portmore Municipal	Deleted(duplication Par004)																		
Min002	St. Catherine PDC	Deleted(same as St. Catherine Parish Counsil)																		
Min003	Earthquake Unit	The University of the west indies Earthquake Unit	18°00'16.2"N	76°44'57.5"W	182	Rep015	Not Visible	14.59	304	0	5	1.15	-100	OK	Type-A	10	30	4	OK	OK
Min004	KSAC	KSAC	17°58'19.59"N	76°47'19.11"W	11	Rep012	Visible	10.32	260	0	5			OK	Type-B	13	15	5	OK	OK
Min005	MET Office	Meteorological Office (MET Office)	17°56'15.2"N	76°46'42.9"W	5	Rep012	Not Visible	11.66	277	0	5	1.15	-95	OK	Type-D	12	2	2	OK	OK
Min006	NSWMA	National Solid Waste Management Authority	18°00'17.74"N	76°47'37.29"W	74	Rep014	Visible	12.62	52	0	5			OK	Type-B	22	50	5	OK	OK
Min007	Ministry of Local Government	Ministry of Local Government	18°00'24.13"N	76°48'47.71"W	43	Rep014	Not Visible	14.01	60	0	5			OK	Type-B	8	15	5	OK	OK
Min008	St. Thomas PDC	St. Thomas Parish Disaster Committee	17 52'51.65"N	76°24'32.96"W	10	Rep010	Not Visible	10	274	0	5			OK	Type-C	8	30	10	OK	OK
Min009	NWA	National Works Agency	18°00'28.62"N	76°47'57.69"W	70	Rep014	Not Visible	12.63	52	0	5			OK	Type-B	13.5	10	10	OK	OK
Min010	WRA	Water Resource Authority (WRA)	18°01'11.8"N	76°44'55.6"W	207	Rep015	Not Visible	13.66	300	0	5	1.15	-97	OK	Type-B	4	10	5	OK	OK

Summary of the Site Survey for the Base Radio Stations (Group-B)

Shows the site deleted.

Items			GPS Receiver Data (DD°MM'SS.S")		Height Above the See Level	LOS of Radio Repeater Station				Voice Call Merit Test (Sensitivity of Transceiver)		Electric Field Strength Measurement		Result of Electric Field Strength	Antenna Installation Plan&Method ・Type-A: Roof top mount ・Type-B: Roof edge mount ・Type-C: Ground Mast mount ・Type-D: Indoor Whip Antenna			Public Property	Site Design Result	Decision of Site Survey Result
Site Code	ODPEM Name	Official name	Longitude	Latitude	Google Earth Data (m)	Name of Target Repeater	Status (Visible/ Not Visible)	Path Length Between Repeater and Site (km)	Direction to Target Repeater (Degree)	Antenna Gain	Result	Antenna Gain	Field Strength (Measurement Level) (dBm)		Installation Type	Antenna Height (GL+m)	Feeder Length Out door (m)	Feeder Length Indoor (m)		
Fir001	York Park	York Park Fire Station - Divisional Headquarters	17°58'54.6"N	76°47'31.0"W	39	Rep015	Not Visible	12.93	320	1.15	5			OK	Type-B	10	20	5	OK	OK
Fir002	Half Way Tree	Half Way Tree Fire Station	18°00'36.08"N	76°47'52.29"W	73	Rep014	Not Visible	12.66	52	0	5			OK	Type-B	15	10	15	OK	OK
Fir003	Trench Town	Trench Town Fire Station	17°58'53.42"N	76°48'23.47"W	21	Rep012	Not Visible	9.27	248	0	5	1.15	-75	OK	Type-B	10	20	5	OK	OK
Fir004	Rollington Town	Rollington Town Fire Station	17°58'41.6"N	76°45'59.5"W	33	Rep015	Not Visible	14.52	320	0	5	1.15	-100	OK	Type-B	9	20	3	OK	OK
Fir005	Stony Hill	Stony Hill Fire Station	18°04'56.67"N	76°47'46.63"W	439	Rep015	Not Visible	7.84	361	1.15	5	1.15	-90	OK	Type-B	15	20	2	OK	OK
Fir006	Port Royal	Port Royal Fire Station	17°56'20.6"N	76°50'31.1"W	5	Rep012	Not Visible	5.16	285	0	5	1.15	-88	OK	Type-B	4	10	10	OK	OK
Fir007	Fire Boat	Fire Boa (Kingston)	17°57'57.33"N	76°48'07.22"W	3	Rep012		9.23	260											
Fir008	Morant Bay	Morant Bay Fire Station	17°52'53.11"N	76°24'27.99"W	17	Rep010	Not Visible	11.37	274	0	5	1.15	-90	OK	Type-C	8	25	10	OK	OK
Fir009	Yallahs	Yallahs Fire Station	17°52'50.6"N	76°35'01.8"W	28	Rep011	Not Visible	9.84	351	11.9	5	1.15 11.9	-100 -85	OK	Type-B	8	30	3	OK	OK
Fir010	St. Anns Bay	St. Anns Bay Fire Station	18°26'12.9"N	77°11'58.4"W	10	Rep001	Not Visible	8.89	237	0	5	1.15	-108	OK	Type-B	4	10	4	OK	OK

Summary of the Site Survey for the Base Radio Stations (Group-B)

Shows the site deleted.

Items			GPS Receiver Data (DD°MM'SS.S")		Height Above the See Level	LOS of Radio Repeater Station				Voice Call Merit Test (Sensitivity of Transceiver)		Electric Field Strength Measurement		Result of Electric Field Strength	Antenna Installation Plan&Method ・Type-A: Roof top mount ・Type-B: Roof edge mount ・Type-C: Ground Mast mount ・Type-D: Indoor Whip Antenna			Public Property	Site Design Result	Decision of Site Survey Result
Site Code	ODPEM Name	Official name	Longitude	Latitude	Google Earth Data (m)	Name of Target Repeater	Status (Visible/ Not Visible)	Path Length Between Repeater and Site (km)	Direction to Target Repeater (Degree)	Antenna Gain	Result	Antenna Gain	Field Strength (Measurement Level) (dBm)		Installation Type	Antenna Height (GL+m)	Feeder Length Out door (m)	Feeder Length Indoor (m)		
Fir011	Ocho Rios	Ocho Rios Fire Station	18°24'02.66"N	77°06'01.32"W	40	Rep002	Not Visible	4.16	207	0	5	1.15	-87	OK	Type-C	6	20	7	OK	OK
Fir012	Browns Town	Brown's Town Fire Station	18°23'48.87"N	77°22'02.38"W	430	Rep001	Not Visible	10.2	92	1.15	5	11.9	-102	OK	Type-B	15	30	10	OK	OK
Fir013	Fire Boat (Ocho Rios)	Fire Boat (Ocho Rios Police Station)	18°24'32.27"N	77°06'35.79"W	0	Rep002	Not Visible	7.27	226	0	5			OK	Type-B	3	10	5	OK	OK
Fir014	Port Maria	Portmaria Fire Station	18°21'33.33"N	76°53'51.88"	13	Rep003	Not Visible	19.64	200°	0	5	1.15	-80	OK	Type-B	4	10	5	OK	OK
Fir015	Annotto Bay	Annotto Bay Fire Station	18°16'13.5"N	76°46'45.9"W	15	Rep003	Not Visible	18.92	287	0	5	1.15	-83	OK	Type-B	5	10	5	OK	OK
Fir016	Port Antonio	Port Antonio Fire Station- Divisional headquarter	18°10'38.65"N	76°27'18.20"W	16	Rep006	Not Visible	2.94	260	1.15	5	11.9	-105	OK	Type-A	12	20	8	OK	OK
Fir017	Buff Bay	Buff Bay Fire Station	18°13'58.13"N	76°39'34.39"W	12	Rep014	Not Visible	7.82	112	11.9	5	11.9	-95	OK	Type-A	13	20	5	OK	OK
Fir018	Falmouth	Falmouth Fire Station- Headquarter	18°29'27.04"N	77°39'06.01"W	2	Rep029	Visible	13.48	101	0	5	1.15	-85	OK	Type-C	12	20	5	OK	OK
Fir019	Spanish Town	Spanish Town Fire Station	17°59'31.01"N	76°57'08.68"W	32	Rep020	Not Visible	11.45	1.5	0	5			OK	Type-B	9.5	15	2	OK	OK
Fir020	Old Harbour	Old Harbour Fire Station	17°56'00.01"N	77°06'35.25"W	28	Rep016	Not Visible	8.65	320	0	5			OK	Type-B	10	10	10	OK	OK

Summary of the Site Survey for the Base Radio Stations (Group-B)

Shows the site deleted.

Items			GPS Receiver Data (DD°MM'SS.S")		Height Above the See Level	LOS of Radio Repeater Station				Voice Call Merit Test (Sensitivity of Transceiver)		Electric Field Strength Measurement		Result of Electric Field Strength	Antenna Installation Plan&Method ・Type-A: Roof top mount ・Type-B: Roof edge mount ・Type-C: Ground Mast mount ・Type-D: Indoor Whip Antenna			Public Property	Site Design Result	Decision of Site Survey Result
Site Code	ODPEM Name	Official name	Longitude	Latitude	Google Earth Data (m)	Name of Target Repeater	Status (Visible/ Not Visible)	Path Length Between Repeater and Site (km)	Direction to Target Repeater (Degree)	Antenna Gain	Result	Antenna Gain	Field Strength (Measurement Level) (dBm)		Installation Type	Antenna Height (GL+m)	Feeder Length Out door (m)	Feeder Length Indoor (m)		
Fir021	Linstead	Linstead Fire Station	18°08'49.70"N	77°02'05.57"W	119	Rep020	Visible	9.86	121	0	5			OK	Type-B	6	10	5	OK	OK
Fir022	Waterford	Waterford Fire Station	17°57'48.99"N	76°52'05.19"W	5	Rep012	Visible	4.19	209	0	5			OK	Type-B	12	20	5	OK	OK
Fir023	May Pen	May Pen Fire Station	17°57'53.3"N	77°14'25.24"W	76	Rep016	Not Visible	9.6	65	0	5	1.15	-105	OK	Type-C	5	20	10	OK	OK
Fir024	Frankfield	Frankfield Fire Station	18°08'40.36"N	77°21'51.31"W	300	Rep018	Not Visible	17.44	300	1.15	5	11.9	-107	OK	Type-B	13	20	10	OK	OK
Fir025	Mandeville	Mandeville Fire Station- Divisional Headquarters	18°02'26.46"N	77°30'28.79"W	618	Rep019	Not Visible	10.23	300	0	5	1.15	-85	OK	Type-B	8	40	8	OK	OK
Fir026	Christiana	Christiana Fire Station	18°10'19.26"N	77°29'28.64"W	823	Rep018	Not Visible	6.43	345	0	5	1.15	-78	OK	Type-B	13	20	5	OK	OK
Fir027	Montego Bay	Free Port Fire Department Head Quarter	18°28'14.94"N	77°55'27.42"W	5	Rep027	Visible	8.86	140	1.15	5	1.15	-85	OK						
Fir028	Ironshore	Ironshore Fire Station	18°30'33.2"N	77°53'39.9"W	10	Rep028	Not Visible	18.24	10	0	5			OK	Type-B	5	10	8	OK	OK
Fir029	Black River	Black River Fire Station Divisional Head Quarters	18°01'28.41"N	77°50'51.06"W	2	Rep019	Not Visible	28	76	0	5	1.15	-98	OK	Type-B	10	20	10	OK	OK
Fir030	Junction	Junction Fire Station	17°54'19.3"N	77°36'22.7"W	366	Rep022	Visible	8.73	284	0	5	1.15	-93	OK	Type-B	10	20	4	OK	OK

Summary of the Site Survey for the Base Radio Stations (Group-B)

Shows the site deleted.

Items			GPS Receiver Data (DD°MM'SS.S")		Height Above the See Level	LOS of Radio Repeater Station				Voice Call Merit Test (Sensitivity of Transceiver)		Electric Field Strength Measurement		Result of Electric Field Strength	Antenna Installation Plan&Method ・Type-A: Roof top mount ・Type-B: Roof edge mount ・Type-C: Ground Mast mount ・Type-D: Indoor Whip Antenna			Public Property	Site Design Result	Decision of Site Survey Result
Site Code	ODPEM Name	Official name	Longitude	Latitude	Google Earth Data (m)	Name of Target Repeater	Status (Visible/ Not Visible)	Path Length Between Repeater and Site (km)	Direction to Target Repeater (Degree)	Antenna Gain	Result	Antenna Gain	Field Strength (Measurement Level) (dBm)		Installation Type	Antenna Height (GL+m)	Feeder Length Out door (m)	Feeder Length Indoor (m)		
Fir031	Santa Cruz	Santa Cruz Fire Station	18°03'23.51"N	77°41'56.47"W	8	Rep019	Not Visible	12	71	0	5	1.15	-75	OK	Type-B	6.5	10	5	OK	OK
Fir032	Savanna-La-Mar	Savanna-La-Mar Fire Station	18°12'55.33"N	78°08'06.39"W	4	Rep023	Not Visible	17.33	105	1.15	5	1.15	-100	OK	Type-B	6	10	6	OK	OK
Fir033	Negril	Negril Fire Station	18°16'41.92"N	78°20'38.44"W	21	Rep024	Not Visible	9.27	248	0	5	1.15	-98	OK	Type-B	10	20	5	OK	OK
Fir034	Lucea	Lucea Fire Station- Headquarters	18°26'48.81"N	78°10'20.95"W	9	Rep026	Visible	10.5	130	0	5	1.15	-84	OK	Type-B	10	20	5	OK	OK
Pol001	Spanish Town	Spanish Town Police Station	17°59'30.22"N	76°57'01.65"W	29	Rep020	Not Visible	11.45	1.5	0	5	1.15	-92	OK	Type-B	5	10	7	OK	OK
Pol003	May Pen	May Pen Police Station	17°57'54.4"N	77°14'21.5"W	63	Rep016	Not Visible	9.6	65	0	5	1.15	-105	OK	Type-B	14	10	2	OK	OK
Pol004	Port Maria	Portmaria Command Center	18°22'21.26"N	76°53'28.36"W	4	Rep003	Not Visible	11.59	200	0	5	1.15	-100	OK	Type-B	10	20	5	OK	OK
Pol008	Castleton	Castleton Police Station	18°10'20.27"N	76°49'26.19"W	145	Rep015	Not Visible	11.78	195	11.9	4	1.15	-95	OK	Type-B	10	20	8	OK	OK
Pol019	Buff Bay	Buff Bay Police Station	18°13'55.02"N	76°39'37.17"W	10	Rep014	Not Visible	7.82	112	11.9	5	11.9	-98	OK	Type-B	8	20	4	OK	OK
Pol020	Old Harbour	Old Harbour Police Station	17°56'18.18"N	77°06'41.54"W	31	Rep016	Not Visible	8.56	320	1.15	5			OK	Type-B	10	10	15	OK	OK

Summary of the Site Survey for the Base Radio Stations (Group-B)

Shows the site deleted.

Items			GPS Receiver Data (DD°MM'SS.S")		Height Above the See Level	LOS of Radio Repeater Station				Voice Call Merit Test (Sensitivity of Transceiver)		Electric Field Strength Measurement		Result of Electric Field Strength	Antenna Installation Plan&Method ・Type-A: Roof top mount ・Type-B: Roof edge mount ・Type-C: Ground Mast mount ・Type-D: Indoor Whip Antenna			Public Property	Site Design Result	Decision of Site Survey Result
Site Code	ODPEM Name	Official name	Longitude	Latitude	Google Earth Data (m)	Name of Target Repeater	Status (Visible/ Not Visible)	Path Length Between Repeater and Site (km)	Direction to Target Repeater (Degree)	Antenna Gain	Result	Antenna Gain	Field Strength (Measurement Level) (dBm)		Installation Type	Antenna Height (GL+m)	Feeder Length Out door (m)	Feeder Length Indoor (m)		
Pol021	Old Harbour Bay	Old Harbour Bay Police Station	17°54'24.67"N	77°05'47.75"W	3	Rep016	Not Visible	12.1	326	0	5			OK	Type-B	6	10	10	OK	OK
Pol025	Mavis Bank	Mavis Bank Police Station	18°01'47.47"N	76°39'26.92"W	700	Rep014	Not Visible	7.11	317	0	5			OK	Type-B	10	10	5	OK	OK
Pol032	Cedar Valley	Cedar Valley Police Station	17°59'41.9"N	76°35'16.7"	613	Rep011	Not Visible	3.59	170	0	5	1.15	-90	OK	Type-B	8.2	20	8.2	OK	OK
Pol037	Ellestson Road	Ellestson Road Police Station	17°56'08.00"N	76°46'44.86"W	14	Rep012	Not Visible	11.71	261	0	5			OK	Type-B	6	10	5	OK	OK
Pol040	Port Royal	Port Royal Police Station	17°56'20.0"N	76°50'35.0"W	3	Rep012	Not Visible	5.1	285	0	5	1.15	-90	OK	Type-C	8	20	5	OK	OK
Pol041	Norman Manley	Norman Manley International Airport Fire Station	17°56'15.3"N	76°46'38.1"W	4	Rep012	Not Visible	11.54	277	0	5	1.15	-95	OK	Type-B	4	10	6	OK	OK
Pol042	Bull Bay	Bull Bay Police Station	17°56'27.70"N	76°40'12.40"	13	Rep011	Not Visible	9.6	74°	0	5	1.15 11.9	-100 -80	OK	Type-C	10	40	40	OK	OK
Pol046	Trinity Ville	Trinity Ville Police Station	17°57'36.8"N	76°31'19.5"W	202	Rep011	Not Visible	6.48	272°	0	5	1.15	-90	OK	Type-B	4.5	20	10	OK	OK
Pol049	Port Morant	Port Morant Police Station	17°53'17.09"N	76°19'45.07"W	19	Rep030	Not Visible	9.59	20	0	5	1.15	-100	OK	Type-B	7	20	5	OK	OK
Pol055	Port Antonio	Portland Police Station - Divisional Headquarter	18°10'43.0"N	76°27'05.2"W	7	Rep006	Not Visible	3.36	260	0	5	1.15	-78	OK	Type-B	10	10	5	OK	OK

Summary of the Site Survey for the Base Radio Stations (Group-B)

Shows the site deleted.

Items			GPS Receiver Data (DD°MM'SS.S")		Height Above the See Level	LOS of Radio Repeater Station				Voice Call Merit Test (Sensitivity of Transceiver)		Electric Field Strength Measurement		Result of Electric Field Strength	Antenna Installation Plan&Method ・Type-A: Roof top mount ・Type-B: Roof edge mount ・Type-C: Ground Mast mount ・Type-D: Indoor Whip Antenna			Public Property	Site Design Result	Decision of Site Survey Result
Site Code	ODPEM Name	Official name	Longitude	Latitude	Google Earth Data (m)	Name of Target Repeater	Status (Visible/ Not Visible)	Path Length Between Repeater and Site (km)	Direction to Target Repeater (Degree)	Antenna Gain	Result	Antenna Gain	Field Strength (Measurement Level) (dBm)		Installation Type	Antenna Height (GL+m)	Feeder Length Out door (m)	Feeder Length Indoor (m)		
Pol061	Linstead	Linstead Police Station	18°08'03.89"N	77°01'54.39"W	128	Rep015	Not Visible	19.57	109	0	5			OK	Type-B	7	20	5	OK	OK
Pol067	Moneague	Monegue Police Station	18°16'20.04"N	77°06'57.07"W	336	Rep003	Not Visible			0	5			OK	Type-B	8	20	15	OK	OK
Pol076	Manchioneal	Manchioneal Police Station	18°02'00.36"N	76°16'46.32"W	24	Rep030	Not Visible	7.31	93	0	5	1.15	-110	OK	Type-C	25	40	8	OK	OK
Pol093	Marine	Marine Police Station	17°57'56.77"N	76°48'10.75"W	5	Rep012	Not Visible	9.08	260	0	5	1.15	-75	OK	Type-B	10	10	10	OK	OK
Pol095	Green Island	Green Island Police Station	18°23'17.78"N	78°16'29.34"W	11	Rep026	Not Visible	18.76	90	11.9	5	11.9	-100	OK	Type-B	6	10	3	OK	OK
Pol099	Lucea	Lucea Police Station- Headquarter	18°26' 59.25"N	78°10'13.58"W	14	Rep026	Not Visible	10.5	130	0	5	1.15	-87	OK	Type-B	6	10	5	OK	OK
Pol105	Montego Bay	Area1 Police Emergency Communication Center	18°28'23.9"N	77°55'15.6"W	8	Rep027	Visible	9.15	140	0	5	1.15	-102	OK	Type-B	10	40	18	OK	OK
Pol111	Falmouth	Trelawny Police Station (Falmouth Police Station and headquarter)	18°29'45.65"N	77°39'24.21"W	6	Rep029	Not Visible	13.5	101	0	5	1.15	-95	OK	Type-B	10	30	5	OK	OK
Pol120	Negril	Negril Police Station	18°16'44.40"N	78°20'34.51"W	6	Rep024	Not Visible	3.95	140	0	5	1.15	-100	OK	Type-B	8	20	6	OK	OK
Pol122	Savanna-La-Mar	Savanna-La-Mar Police Station-Headquarter	18°13'06.3"N	78°08'00.00"W	9	Rep023	Not Visible	17.33	106	1.15	5	1.15	-105	OK	Type-B	6.5	10	5	OK	OK

Summary of the Site Survey for the Base Radio Stations (Group-B)

Shows the site deleted.

Items			GPS Receiver Data (DD°MM'SS.S")		Height Above the See Level	LOS of Radio Repeater Station				Voice Call Merit Test (Sensitivity of Transceiver)		Electric Field Strength Measurement		Result of Electric Field Strength	Antenna Installation Plan&Method ・Type-A: Roof top mount ・Type-B: Roof edge mount ・Type-C: Ground Mast mount ・Type-D: Indoor Whip Antenna			Public Property	Site Design Result	Decision of Site Survey Result
Site Code	ODPEM Name	Official name	Longitude	Latitude	Google Earth Data (m)	Name of Target Repeater	Status (Visible/ Not Visible)	Path Length Between Repeater and Site (km)	Direction to Target Repeater (Degree)	Antenna Gain	Result	Antenna Gain	Field Strength (Measurement Level) (dBm)		Installation Type	Antenna Height (GL+m)	Feeder Length Out door (m)	Feeder Length Indoor (m)		
Pol129	St. Anns Bay	St. Ann's Bay Police Station-Headquarter	18°26'07.33"N	77°11'57.80"W	15		Not Visible			0	5	1.15	-75	OK	Type-B	10.5	10	6	OK	OK
Pol130	Ocho Rios	Ocho Rios Police Station	18°24'30.45"N	77°06'07.65"W	6	Rep002	Not Visible	4.78	207	0	5	1.15	-82	OK	Type-B	6	10	15	OK	OK
Pol139	Newmarket	Newmarket Police Station	18°09'43.1"N	77°54'55.0"W	357	Rep023	Not Visible	8.33	N/A	0	5	1.15	-88	OK	Type-C	7	10	5	OK	OK
Pol141	Black River	Black River Police Station	18°01'29.05"N	77°50'56.24"W	7	Rep019	Not Visible	28	76	0	5	1.15	-85	OK	Type-B	11	10	30	OK	OK
Pol143	Santa Cruz	Santa Cruz Police Station	18°03'02.24"N	77°41'55.27"W	24	Rep019	Not Visible	12.22	71	0	5	1.15	78	OK	Type-B	5	10	5	OK	OK
Pol154	Alligator Pond	Alligator Pond Police Station	17°52'12.75"N	77°33'56.91"W	8	Rep019	Not Visible	24.05	300	11.9	5	11.9	-108	OK	Type-C	10	20	4	OK	OK
Pol156	Porus	Porus Police Station	18°02'04.1"N	77°24'40.2"W	134	Rep019	Not Visible	19.73	286	0	5	1.15	-105	OK	Type-C	10	20	5	OK	OK
Pol157	Mandeville	Mandeville Police Station	18°02'23.21"N	77°30'25.69"W	628	Rep019	Not Visible	10.23	300	0	5	1.15	-85	OK	Type-B	10	10	5	OK	OK
Pol165	Whitehouse	Whitehouse Police Station	18°05'26.03"	77°57'57.39"	21	Rep023	Not Visible	9.66	340	1.15	5	1.15	-100	OK	Type-B	6	10	3	OK	OK
Pol182	Lionel Town	Lionel Town police Station	17°48'27.44"N	77°14'34.13"W	12	Rep017	Not Visible	11.64	128	0	5			OK	Type-B	15	10	15	OK	OK

Summary of the Site Survey for the Base Radio Stations (Group-B)

Shows the site deleted.

Items			GPS Receiver Data (DD°MM'SS.S")		Height Above the See Level	LOS of Radio Repeater Station				Voice Call Merit Test (Sensitivity of Transceiver)		Electric Field Strength Measurement		Result of Electric Field Strength	Antenna Installation Plan&Method ・Type-A: Roof top mount ・Type-B: Roof edge mount ・Type-C: Ground Mast mount ・Type-D: Indoor Whip Antenna			Public Property	Site Design Result	Decision of Site Survey Result
Site Code	ODPEM Name	Official name	Longitude	Latitude	Google Earth Data (m)	Name of Target Repeater	Status (Visible/ Not Visible)	Path Length Between Repeater and Site (km)	Direction to Target Repeater (Degree)	Antenna Gain	Result	Antenna Gain	Field Strength (Measurement Level) (dBm)		Installation Type	Antenna Height (GL+m)	Feeder Length Out door (m)	Feeder Length Indoor (m)		
Pol184	Annotto Bay	Annotto Bay Police Station	18°16'13.7"N	76°46'22.1"W	6	Rep003	Not Visible	19.59	287	0	5	1.15	-85	OK	Type-B	6	10	6	OK	OK
Hos001	Victoria Jubilee	Victoria Jubilee Hospital	17°58'37.98"N	76°47'43.08"W	25	Rep015	Visible	13.13	320	0	5			OK	Type-B	25	10	40	OK	OK
Hos002	National Chest Hospital (~~Kingston Public~~)	National Chest Hospital	18°01'20.50"N	76°45'39.77"W	173	Rep014	Not Visible	8.8	45.08				Refer to Hos009	OK	Type-B	6	20	5	OK	OK
Hos003	Bustamante Children's	Bustamante Hospital for Children	17°59'58.38"N	76°46'40.82"W	90	Rep014	Not Visible	11.54	43	0	5			OK	Type-B	4.7	10	10	OK	OK
Hos004	Kingston Public	Kingston Public Hospital	17°58'34.92"N	76°47'44.08"W	25	Rep015	Visible	13.23	320	0	4			OK	Type-B	8	10	10	OK	OK
Hos005	University	University Hospitals Kingston Foundation	18°00'41.80"N	76°44'39.20"W	179	Rep015	Not Visible	15.48	303	0	4			OK	Type-B	6	10	10	OK	OK
Hos006	Sir. John Golding	Sir. John Golding Rehabilitation Center	18°00'15.0"N	76°44'23.8"W	183	Rep015	Not Visible	15.43	303	0	5	1.15	-90	OK	Type-B	8	20	25	OK	OK
Hos007	Hope Institute	Hope Institute Hospital			143	Rep015	Not Visible	15.86	303	0	5	1.15	-93	OK	Type-C	5	10	8	OK	OK
Hos008	Bellevue	Bellevue Hospital	17°58'15.1"N	76°46'20.8"W	14	Rep012	Not Visible	12.52	261	0	5	1.15	-82	OK	Type-B	3.5	10	8	OK	OK
Hos009	Andrews Memorial	Andrews Memorial Hospital	18°00'52.96"N	76°47'18.54"W	97	Rep014	Not Visible	11.46	52	0	5			OK	Type-B	7	10	15	OK	OK

Summary of the Site Survey for the Base Radio Stations (Group-B)

Shows the site deleted.

Items			GPS Receiver Data (DD°MM'SS.S")		Height Above the See Level	LOS of Radio Repeater Station				Voice Call Merit Test (Sensitivity of Transceiver)		Electric Field Strength Measurement		Result of Electric Field Strength	Antenna Installation Plan&Method ・Type-A: Roof top mount ・Type-B: Roof edge mount ・Type-C: Ground Mast mount ・Type-D: Indoor Whip Antenna			Public Property	Site Design Result	Decision of Site Survey Result
Site Code	ODPEM Name	Official name	Longitude	Latitude	Google Earth Data (m)	Name of Target Repeater	Status (Visible/ Not Visible)	Path Length Between Repeater and Site (km)	Direction to Target Repeater (Degree)	Antenna Gain	Result	Antenna Gain	Field Strength (Measurement Level) (dBm)		Installation Type	Antenna Height (GL+m)	Feeder Length Out door (m)	Feeder Length Indoor (m)		
Hos010	Medical Associates	Medical Associates Hospital	18°00'23.60"N	76°47'32.00"W	30	Rep014	Not Visible	14.9	48	0	5			OK	Type-B	5	10	15	OK	OK
Hos011	Maxfiled Medical	Deleted(Small Clinic)																		
Hos012	St. Joseph's	St. Joseph's Hospital & Medical Centre	17°58'49.10"N	76°46'17.41"W	74	Rep014	Not Visible	12.71	43	0	5			OK	Type-B	4.5	10	10	OK	OK
Hos013	Nuttal Memorial	Nuttal Memorial Hospital	17°59'40.7"N	76°47'08.7"W	39	Rep015	Not Visible	14.52	320	0	5			OK	Type-B	7	20	5	OK	OK
Hos014	Princess Margaret	Princess Margaret Hospital	17°52'49.09"N	76°23'27.13"W	23	Rep010	Not Visible	9.51	274	0	5	1.15	-90	OK	Type-C	10	30	10	OK	OK
Hos015	Port Antonio	Port Antonio Hospital	18°10'34.68"N	76°27'21.80"W	50	Rep006	Not Visible	2.72	260	1.15	5	1.15	-98	OK	Type-B	7	10	7	OK	OK
Hos016	Annotto Bay	Annotto Bay Hospital	18°16'23.4"N	76°45'42.9"W	9	Rep003	Not Visible	20.61	284	0	5	1.15	-95	OK	Type-B	4	20	9	OK	OK
Hos017	Port Maria	Portmaria Hospital	18°21'29.20"N	76°53'42.67"W	34	Rep003	Not Visible		200°	0	5	1.15	-95	OK	Type-B	6	10	5	OK	OK
Hos018	St.Anns's Bay	St. Ann's Bay Hospital	18°26' 10.8"N	77°12'36.9"W	32	Rep001	Not Visible	7.84	232	0	5	1.15	-107	OK	Type-B	5	20	12	OK	OK
Hos019	Falmouth	Falmouth Hospital	18°29'48.17"N	77°39'36.83"W	3	Rep029	Visible	13.15	101	0	5	1.15	-95	OK	Type-B	10	10	5	OK	OK

Summary of the Site Survey for the Base Radio Stations (Group-B)

Shows the site deleted.

Items			GPS Receiver Data (DD°MM'SS.S")		Height Above the See Level	LOS of Radio Repeater Station				Voice Call Merit Test (Sensitivity of Transceiver)		Electric Field Strength Measurement		Result of Electric Field Strength	Antenna Installation Plan&Method ・Type-A: Roof top mount ・Type-B: Roof edge mount ・Type-C: Ground Mast mount ・Type-D: Indoor Whip Antenna			Public Property	Site Design Result	Decision of Site Survey Result
Site Code	ODPEM Name	Official name	Longitude	Latitude	Google Earth Data (m)	Name of Target Repeater	Status (Visible/ Not Visible)	Path Length Between Repeater and Site (km)	Direction to Target Repeater (Degree)	Antenna Gain	Result	Antenna Gain	Field Strength (Measurement Level) (dBm)		Installation Type	Antenna Height (GL+m)	Feeder Length Out door (m)	Feeder Length Indoor (m)		
Hos020	Cornwall Regional	Cornwall Regional Hospital	18°28'08.57"N	77°54'34.97"W	68	Rep027	Not Visible	7.9	140	0	5	1.15	-81	OK	Type-B	9.6	10	5	OK	OK
Hos021	Doctors Hospital	Doctors' Surgi Clinic	18°27'29.73"N	77°56'19.34"W	39	Rep027	Not Visible	6.13	140	0	5	1.15	-98	OK	Type-B	10	40	10	OK	OK
Hos022	Mobay Hope	Deleted (Private hospital)																		
Hos023	Faith Maternity	Deleted (old-age home)																		
Hos024	Noel Holmes	Noel Holmes Hospital	18°27'07.92"N	78°10'03.51"	11	Rep026	Visible	10.46	130	0	5	1.15	-84	OK	Type-B	10	40	10	OK	OK
Hos025	Sav-La-Mar	Savanna-La-Mar Hospital	18°13'34.9"N	78°07'44.6"W	14	Rep023	Not Visible	17.33	106	0	5	1.15	-98	OK	Type-B	14	30	20	OK	OK
Hos026	Royal Medical	Royale Medical Hospital	18°13'21.2"N	78°07'54.1"W	9	Rep025	Not Visible			0	5	1.15	-98	OK	Type-B	8.2	40	14	OK	OK
Hos027	Black River	Black River Hospital	18°01'36.67"N	77°51'31.83"W	3	Rep019	Not Visible	28	76	0	5	1.15	-85	OK	Type-B	8	20	25	OK	OK
Hos028	Mandeville Regional	Mandeville Regional Hospital	18°02'32.7"N	77°30'32.7"W	628	Rep019	Not Visible	9.65	300	0	5	1.15	-90	OK	Type-B	8	40	8	OK	OK
Hos029	Hargreaves Memorial	Deleted (Private hospital)																		

Summary of the Site Survey for the Base Radio Stations (Group-B)

Shows the site deleted.

Items			GPS Receiver Data (DD°MM'SS.S")		Height Above the See Level	LOS of Radio Repeater Station				Voice Call Merit Test (Sensitivity of Transceiver)		Electric Field Strength Measurement		Result of Electric Field Strength	Antenna Installation Plan&Method ・Type-A: Roof top mount ・Type-B: Roof edge mount ・Type-C: Ground Mast mount ・Type-D: Indoor Whip Antenna			Public Property	Site Design Result	Decision of Site Survey Result
Site Code	ODPEM Name	Official name	Longitude	Latitude	Google Earth Data (m)	Name of Target Repeater	Status (Visible/ Not Visible)	Path Length Between Repeater and Site (km)	Direction to Target Repeater (Degree)	Antenna Gain	Result	Antenna Gain	Field Strength (Measurement Level) (dBm)		Installation Type	Antenna Height (GL+m)	Feeder Length Out door (m)	Feeder Length Indoor (m)		
Hos030	Percy Junior	Percy Junior Hospital	18°09'18.0"N	77°27'55.9"W	826	Rep017	Not Visible			0	5	1.15	-93	OK	Type-B	7	10	5	OK	OK
Hos031	May Pen	May Pen Hospital	17°58'25.2"N	77°15'37.9"W	64	Rep016	Not Visible	109	76	0	5	1.15	-105	OK	Type-B	5	10	15	OK	OK
Hos032	Lionel Town	Lionel Town Hospital	17°48'29.01"N	77°14'29.10"W	10	Rep017	Not Visible	11.39	128	0	5			OK	Type-C	9	10	10	OK	OK
Hos033	Spanish Town	Spanish Town Hospital	17°59'30.28"N	76°56'49.94"W	25	Rep020	Not Visible	11.53	1.5	0	5			OK	Type-B	6.5	20	5	OK	OK
Hos034	Linstead	Linstead Hospital	18° 7'58.73"N	77° 1'53.27"W	128	Rep020	Not Visible	9.86	116	1.15	5	1.15	-112	OK	Type-B	8.5	20	10	OK	OK
Hos035	Mona Rehabilitation Centre	Deleted (duplication, a part of Sir. John Golding(Hos006)																		
Par001	Clarendon Parish Counsil	Clarendon Parish Counsil	17°58'04.0"N	77°14'23.5"W	81	Rep016	Visible	9.17	65	0	5			OK	Type-A	10	20	5	OK	OK
Par002	Hanover Parish Counsil	Hanover Parish Counsil	18°26'48.7"N	78°10'20.08"W	7	Rep026	Visible	10.4	130	0	5	1.15	-84	OK	Type-B	12	20	5	OK	OK
Par003	Manchester Parish Counsil	Manchester Parish Counsil	18° 2'33.9"N	77°30'26.1"W	611	Rep019	Not Visible	9.95	300	0	5	1.15	-87	OK	Type-B	UHF:6 VHF:6 HF: 8	30	5	OK	OK
Par004	Municipal Office of Portmore	Municipal Office of Portmore	17°55'48.99"N	76°53'35.34"W	8	Rep012	Visible	1.47	158	0	5	1.15	-60	OK	Type-B	UHF: 10 VHF: 10 HF: 14	UHF/VHF 10 HF 10	8	OK	OK

Summary of the Site Survey for the Base Radio Stations (Group-B)

Shows the site deleted.

Items			GPS Receiver Data (DD°MM'SS.S")		Height Above the See Level	LOS of Radio Repeater Station				Voice Call Merit Test (Sensitivity of Transceiver)		Electric Field Strength Measurement		Result of Electric Field Strength	Antenna Installation Plan&Method ・Type-A: Roof top mount ・Type-B: Roof edge mount ・Type-C: Ground Mast mount ・Type-D: Indoor Whip Antenna			Public Property	Site Design Result	Decision of Site Survey Result
Site Code	ODPEM Name	Official name	Longitude	Latitude	Google Earth Data (m)	Name of Target Repeater	Status (Visible/ Not Visible)	Path Length Between Repeater and Site (km)	Direction to Target Repeater (Degree)	Antenna Gain	Result	Antenna Gain	Field Strength (Measurement Level) (dBm)		Installation Type	Antenna Height (GL+m)	Feeder Length Out door (m)	Feeder Length Indoor (m)		
Par005	Portland Parish Counsil	Portland Parish Counsil	18°10'47.4"N	76°27'04.2"W	8	Rep006	Not Visible	3.43	260	0	5	1.15	-100	OK	Type-B	UHF: 10 VHF: 10 HF: 12	UHF/VHF 8 HF 30	UHF/VHF 12 HF 10	OK	OK
Par006	Trelawny Parish Counsil	Trelawny Parish Counsil	18°29'25.28"N	77°39'05.59"W	1	Rep029	Visible	12.42	101	0	5	1.15	-85	OK	Type-B	10	10	5	OK	OK
Par007	St. Catherine Parish Counsil	St. Catherine Parish Counsil	17°59'46.41"N	76°57'16.97"W	34	Rep020	Not Visible	11.02	1.5	0	5			OK	Type-B	14	20	10	OK	OK
Par008	St. Elizabeth Parish Counsil	St. Elizabeth Parish Counsil	18°01'33.60"N	77°51'12.89"W	3	Rep019	Not Visible	28	76	0	5	1.15	-92	OK	Type-B	UHF: 7.2 VHF: 7.2 HF: 10.2	20	11	OK	OK
Par009	St. James Parish Counsil	St. James Parish Counsil	18°28'28.4"N	77°55'18.2"W	7	Rep027	Visible	8.99	140	0	5	1.15	-88	OK	Type-B	23	30	46	OK	OK
Par010	St. Mary Parish Counsil	St. Mary Parish Counsil	18°22'23.25"N	76°53'37.59"	12	Rep003	Not Visible	4.59	200°	0	4	1.15 11.9	-105 -92	OK	Type-B	UHF: 9 VHF: 9 HF: 12	20	5	OK	OK
Par011	Kingston & St. Andrew Corporation	KSAC Corporation Office	17°58'01.1"N	76°47'30.9"W	20	Rep015	Not Visible	13.96	320	0	5	1.15	-100	OK	Type-B	10	20	20	OK	OK
Par012	St.Thomas Parish Counsil	St.Thomas Parish Counsil	17°52'50.39"N	76°24'47.49"W	11	Rep010	Not Visible	10.01	274	0	5	1.15	-90	OK	Type-B	14	40x3	15x3	OK	OK
Par013	Westmoreland Parish Counsil	Westmoreland Parish Counsil	18°13'06.3"N	78°08'01.5"W	7	Rep023	Not Visible	15.66	106	0	5			OK	Type-B	8	40	20		
Par014	St. Ann Parish Counsil	St. Ann Parish Counsil	18°26'09.8"N	77°12'09.3"W	18	Rep001	Not Visible	8.51	237	0	5	1.15	-110	OK	Type-B	UHF: 4 VHF: 4 HF: 6	20	30	OK	OK